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THE BOSTON
MEDICAL & Surgical
JOURNAL.

Charles W. Townsend.
Dec 29. 1896.

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A TREATISE

ON

OBSTETRICS

FOR STUDENTS AND PRACTITIONERS.

BY

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ILLUSTRATED WITH 217 ENGRAVINGS, AND 30 PLATES IN COLORS AND MONOCHROME.

LEA BROTHERS & CO.,

PHILADELPHIA AND NEW YORK.

1896.

16188

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PREFACE.

In the preparation of the present volume it has been the aim of the author to furnish to the student a text-book and to the practitioner a work of reference, in which both the science and the art of obstetrics should be fully set forth in accordance with the most modern results of investigation and experience. Obstetric surgery, which of late years has had so conspicuous a development, has received special attention; while the hygiene of pregnancy, parturition, lactation, and recovery from labor have been treated in the minute detail requisite to protect the health of mother and child. As mothers, moreover, naturally regard the obstetrician as the proper adviser for the infant, the disorders of infancy have been considered as a necessary part of the subject.

It has seemed to the author that nomenclature and diagnosis have been rendered unnecessarily confused by complicated terminology and theoretical distinctions, and he has endeavored to avoid this by a method simple, direct, and practical. Extensive experience both as a teacher and clinician has familiarized him with the needs of both students and practitioners, and these he has endeavored to meet, not only in the manner of presentation, but in condensing the results of recent research, and in advising those modes of treatment only which have proved trustworthy in practice.

Of the very complete and beautiful series of illustrations, many are photographic reproductions from obstetric cases, carefully selected in view of the amount, vividness, and permanence of knowledge which can be conveyed in no other way. For those selected from the works of other writers due credit has been given, and the author's thanks are especially rendered to Professor L. H. Farabeuf and Dr. Henri Varnier for permission to copy figures

from the well-known volume of Farabeuf and Varnier. His acknowledgments are also due to Dr. Stricker Coles, his chief clinical assistant at the Jefferson Maternity, and Miss Margaret Russell, chief nurse, for assistance in preparing the series of photographs of obstetrical cases, while Dr. Charles S. Dolley has kindly aided in the preparation of the section on Embryology.

250 South Twenty-first Street.
October, 1896.

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OBSTETRICS.

INTRODUCTORY.

Obstetrics is that branch of medical science which deals with mother and child, from the beginning of pregnancy until the mother has completely recovered from labor and its consequences. Several divisions of science treat of subjects which pertain to obstetrics, as anatomy, which describes the body of the mother before pregnancy occurs; physiology, which treats of ovulation, menstruation, and impregnation; and embryology, which is devoted to the growth and development of the child. The science of obstetrics embraces in part these different branches, in addition to a study of the phenomena of parturition in all its phases, and of the puerperal condition. Obstetric art has to do with the diagnosis of the pregnant condition, its treatment, the management of labor, the detection and treatment of abnormalities in the process of parturition, and the care of the mother and her child until the former is able to take care of herself and her infant. A considerable range of medicine, surgery, and pathology is included in obstetric art, for the obstetrician who is not versed in medicine and pathology will fail to understand and properly treat the complications of pregnancy, and he who has no knowledge and skill in surgery cannot rescue mother and child from the dangers of complicated labor nor repair the injuries which may arise during parturition.

The broadening of medical education and the growth of special study have rendered the entire field of obstetrics too wide a territory to be thoroughly covered by the work and study of the active practitioner. The medical student who is properly instructed in anatomy studies the pelvis of the female with that of the male subject. His course in physiology informs him regarding the phenomena of biology, and hence ovulation, menstruation, and impregnation are studied in this department of science. Anyone who follows biology beyond its rudiments obtains a knowledge of embryology, which explains the phenomena of the growth of the human fœtus. The study of medicine, surgery, and pathology fits the medical student to appreciate the phenomena of pregnancy and labor. Obstetrics is appropriately a senior study, and should properly be undertaken during the last half of a medical course. The double responsibility which the obstetrician is called to bear in protecting the lives of mother and child, and the

emergencies of obstetric practice, often serious in character, demand powers of diagnosis and decision, with skill in execution, which require the full development of the trained physician. As modern medical education is largely clinical in character, competent obstetrical teaching must include clinical instruction, with the same facilities and thoroughness which have brought medical training to its present advanced stage in other branches. The purpose of this book is to describe, within convenient limits, obstetric art, with a special regard to modern methods of diagnosis and treatment.

SECTION I.

PREGNANCY AND LABOR.

CHAPTER I.

OBSTETRIC DIAGNOSIS.

Obstetric diagnosis, in common with diagnosis in other branches of medicine, is based upon a thorough survey of the patient, supplemented by careful consideration of the various symptoms which the patient describes. The circumstances under which the obstetrician makes a diagnosis are often different from those which surround investigation with other patients. The occurrence of pregnancy is often a matter which the patient conceals as long as possible, and regarding which her statements may be purposely or ignorantly misleading. This is especially true of illegitimate pregnancies, where the most strenuous efforts are often made to conceal the condition. In no class of cases is such care requisite to arrive at a positive conclusion, and with no patients is caution so necessary to avoid error.

Methods of making an obstetric diagnosis consist : First, in obtaining from the patient all the information available regarding her health, and especially concerning the condition which gives rise to the suspicion of pregnancy. In many cases the history, together with many of the obvious phenomena of pregnancy, easily detected, make a diagnosis a comparatively simple matter, and may even render an examination, for the time being, an unnecessary procedure. On the other hand, the most careful examination will occasionally fail to detect the positive signs of pregnancy. and the element of time must be called into play to arrive at a correct judgment.

It cannot be too strongly emphasized that thorough physical examination is absolutely essential for the positive diagnosis of pregnancy, and that no array of symptoms, however typical, should lead the practitioner to neglect the obtaining of positive knowledge.

In obtaining a history pointing to pregnancy the first symptom which the patient will describe will be disordered menstruation, or amenorrhœa. If the patient wishes to conceal pregnancy, and she is asked whether menstruation continues, she may give an affirmative answer or may evade the question by asserting that this function has never been regularly performed. It is well, if possible, to bring her to describe any deviation from her accustomed health which causes her to seek the aid of a physician. As a rule, however, the patient will reply to a question regarding a change in her general health with

the statement that she has not menstruated or has done so irregularly for a varying period of time.

In estimating the value of this symptom the obstetrician has to remember the distinction between ovulation and menstruation. It has been repeatedly shown that ovulation continues in cases in which menstruation is absent. Anæmia, change of climate and occupation, or any great nervous strain, are common causes of amenorrhœa. If a patient asserts that she has not menstruated for some time, the inquiry should be made as to whether any cause, other than pregnancy, productive of the amenorrhœa, exists. Very often anæmia, tubercular infection, exhaustion, or a pathological condition of the pelvic organs may be found, accounting for the absence of menstruation. In rare cases of very young women menstruation has not occurred before impregnation, and here the symptom of amenorrhœa would be only of comparative value. The age of the patient must not mislead the obstetrician, for cases are not infrequently seen in which menstruation has persisted beyond the usual limit, and in which pregnancy has occurred after the forty-fifth year.

It is not unusual for a pregnant patient to menstruate once, or to suffer from slight oozing of blood at the menstrual periods during her pregnancy. Some of these cases are attended by slight pain occurring at the time when menstruation would have occurred if pregnancy were not present. Careful questioning, however, on the part of the obstetrician will elicit the fact that this menstruation, or this irregular discharge of blood, is not typical menstruation. So far as scientific investigation goes, it is well determined that typical menstruation does not occur during pregnancy.

In questioning the patient upon the subject of the cessation of menstruation the physician will do well to ascertain, if possible, the precise date at which the last menstrual period ended ; from this date is to be reckoned the beginning of pregnancy.

In describing the symptoms which point to pregnancy the patient will next in order of frequency complain of some disorder of digestion ; this is usually nausea, often accompanied by vomiting, and most frequently occurring during the early portion of the day. In some patients the sensation of nausea follows immediately the raising of the head from the pillow ; in others it does not come on until the patient is up and about, and often follows the taking of fluid, or any irritation of the fauces, such as is caused in gargling the throat after brushing the teeth. Other patients are sick for a considerable portion of the day, this sickness not passing off until toward evening.

Some pregnant women complain of heartburn, with sour eructations, while others suffer from an annoying flow of saliva, which comes on soon after eating. Abnormalities in appetite are frequently observed in nervous women, for the most part simply indicating a disordered condition of the nervous system, but occasionally affording a valuable indication of the patient's needs. Rarely patients are found who are not only not sick during pregnancy, but who experience a marked increase in appetite with a great improvement in digestion. If one were to describe what might be termed the typical nausea and

vomiting of pregnancy, it would be that which occurs soon after rising, which is described by the patient as simply an impulse to empty the stomach. When this is done, a mouthful or two of watery mucus is expelled, and the nausea speedily passes away.

Some patients complain of obstinate constipation, occurring from the very beginning of pregnancy. Less frequently, pregnant patients suffer from diarrhœa. Aversion to a particular article of diet is observed with some, and may even become a distinctive sign of pregnancy in multigravidous women. Cases are reported in which the first suspicion of pregnancy was caused by a sudden loathing of a familiar article of diet.

Next in frequency as a subjective symptom of pregnancy patients describe abnormal sensations in the region of the pelvis. Although the size of the womb is not sufficiently great before the second month to occasion much pressure in the pelvis, in cases in which the uterus is retroverted and retroflexed pregnancy may have proceeded but a few weeks when the patient complains of weight and heaviness, backache upon exertion, and often interference with the functions of the rectum. If the uterus be anteflexed and impacted in the pelvic brim, disturbance in micturition will more frequently be complained of. As the pregnancy proceeds toward the third or fourth month these symptoms will increase in either case until the uterus rises out of the pelvis.

Nearly all pregnant patients describe, when questioned, disorders in general health and in the functions of the nervous system. Many suffer from neuralgia, others from headache, others from perversions of sensation in the cutaneous nerves, or, less commonly, in the nerves of the special senses, while the whole nervous system becomes unduly sensitive and irritable to reflex excitants. Disturbed sleep, apprehension of injury or accident, melancholia, or perversions of the affections are not infrequently observed.

Disturbances in the skin are often reported by pregnant patients. Brownish-yellow blotches upon the face, brownish pigmentation upon the abdomen, and obstinate itching often about the region of the genital organs are not infrequently observed.

Swelling of the feet and legs, enlargement of the neck, enlargement and sensitiveness of the breasts, with tingling pains in the nipples, are often present in pregnant patients. A vaginal discharge of whitish mucus is common during pregnancy, while many patients describe the formation of hemorrhoids during this period.

In women who have borne children the mother's sensations usually render her more or less positive of the existence of pregnancy. In women pregnant for the first time all of these symptoms may be absolutely denied, or all of them may be described by the patient, either truly or erroneously.

Having noted the symptoms of pregnancy as narrated by the patient, the physician must then proceed to an examination with a view of positively determining the occurrence of pregnancy. The method of examination should vary in accordance with the objects in view : If a physician be asked to give a positive opinion regarding the existence of pregnancy in an early stage, he must, of course, shape his examination

in accordance with that end ; if, however, the pregnancy, if present, has advanced to the sixth month or more, his examination should then embrace not only the presence or absence of pregnancy, but, if pregnancy be found, this examination should also include the measurement of the patient's pelvis, the mapping out of the fœtus, the determination of the presentation and the attitude of the fœtus, the establishment of the period of gestation, the location of the placenta, the relative size of the fœtus and the pelvis, and the presence of any abnormality in the patient's abdomen or pelvis which might complicate her labor.

Taking, however, the question of the existence of early pregnancy, the examination of the patient should be conducted as follows : The physician should first thoroughly examine the patient for evidence, outside of the pelvis and its contents, of pregnancy ; he will do well to inspect the face for signs of alteration in the skin ; the size of the thyroid gland should be noted ; sensitiveness in any of the nerve-trunks of the face should be located, if the patient complains of pain in the face. The breasts should be inspected and their size and consistence noted, and also the presence or absence of fluid in the breasts. The nipples should be carefully inspected, and especially the areola about the nipples, in which is observed in pregnant patients a change in color from an increase in pigmentation, or alteration in pigment already deposited. The abdomen should be carefully palpated to determine the presence or absence of an abnormal condition, such as ovarian tumor, floating kidney, ascites, fibroid of the uterus, or chronic peritonitis, which might possibly give rise to a suspicion of pregnancy. It is well to have the physician's scrutiny embrace the heart and lungs, for, if pregnancy be present, the heart will be found more easily disturbed in its rhythm than normally. In some patients an examination of the lungs will detect an area of consolidation and evidence of tubercular deposit, which, taken together with the patient's anæmic condition, will explain amenorrhœa in her case. It is well, also, to examine the feet and legs to ascertain accurately the presence or absence of swelling in these parts.

The most important part of the examination to detect the presence of early pregnancy consists in the examination of the pelvic organs. For this purpose the rectum and bladder should be empty, and if the patient states that her bowels have not moved properly for several days, it is better to prescribe a purgative and to postpone the pelvic examination until the rectum is empty. It is always better to give the patient plainly to understand that as she asks a positive statement from the observer, that it is impossible to give such without an internal examination. This should always be conducted in the presence of a third person, and, preferably, with the assistance of a nurse. The patient's clothing should be absolutely loose, and so arranged that the physician can readily place his hand upon the abdomen and upon the pubes. The patient may lie upon the back or upon the left side. The physician should cleanse his hands thoroughly with soap and hot water, thereby rendering them more sensitive to touch and avoiding discomfort for the patient. The physician's hands should also be rendered aseptic. It is well to anoint the examining-finger with an antiseptic ointment, for

which the following is a useful formula : Boric acid, ten grains ; lanolin, cosmoline, each one-half ounce ; carbolized vaseline or glycerin and bichloride may be used. Castile soap is often convenient.

In primigravidæ a physician can often make a more thorough examination with the patient lying upon her side, because in this position he can draw the perineum backward, and thus gain better access to the uterus. The examination should be bimanual, the hand behind the pubes pressing downward and palpating the uterus through the abdominal wall. If a positive opinion be desired, and the patient be nervous and difficult to examine, it is often well to anæsthetize her before the examination. Bromide of ethyl and chloroform are excellent anæsthetics for such use.

In making this examination the physician will note by the sensation conveyed to the finger whether the arteries in the vagina pulsate markedly or whether there is no evidence of increased vascularity in this region. He will also observe by touch any marked increase in the temperature of the part and the presence or absence of secretion. If the womb is in normal position, and pregnancy exists, the physician will often find it advantageous to place the patient upon the side and to draw the perineum backward as the finger proceeds toward the cervix. The physician will remember that the cervix in the non-pregnant patient is firm, small, and conveying no sensation of softness upon touch. In pregnancy, however, the cervix has a soft, velvety feel, and it is manifestly enlarged ; for the first few weeks of pregnancy there is often a plug of mucus in the cervical canal, the whole constituting a marked difference between the cervix of pregnancy and that in the non-pregnant.

The point of greatest importance to determine, and upon which the diagnosis of early pregnancy may be established or rejected, is the comparative size of the body of the uterus and the cervix, together with the presence or absence of the lower uterine segment. In proceeding to ascertain the size of the body of the womb vaginal examination is usually all that is necessary. Occasionally the physician is obliged to supplement vaginal examination by examination also through the rectum ; in case of the former, after examining the os and cervix, the finger should be passed above the os and carried around the cervix in a circle, seeking to ascertain the presence of the body of the womb above. The suprapubic hand should press the uterus gently down. The sensation conveyed to the finger by the uterus six weeks or more pregnant is that immediately above the cervix the tissue bulges in an irregular, globular form, often slightly doughy or boggy to the touch. The relation between the cervix and this bulging tissue may be likened to the contour of an earthen jug, in which the body of the jug bulges out from the short neck. In case the uterus is distorted by retroflexion or anteflexion, the globular shape of the body will not be apparent, but the sudden enlargement of the upper segment in contrast with the condition of the cervix will be recognized.

Having noted that the body of the womb is enlarged, the examiner should next endeavor to detect the presence of the lower uterine segment ; this consists of fibrous and elastic tissue which connects the

upper, thick, contractile segment of the uterus with the cervix. While investigators differ as to the condition of the cervix during pregnancy, the weight of evidence is in favor of the belief that the cervix does not increase in length during pregnancy, but that the greater length of the uterus as pregnancy advances is owing to the development of the lower uterine segment and the growth of the upper contractile segment. This elastic portion may be recognized so early as five or six weeks of gestation, if the observer can get the finger just above the cervix, strongly indenting the uterus at that level.

In cases where the uterus can be pressed down in the pelvis the finger in the vagina will be able to indent the tissues just above the cervix. In other cases where the uterus is inaccessible it is sometimes possible, by inserting the longest finger of the hand in the rectum, to appreciate the existence of the lower, elastic uterine segment. When the examiner can clearly outline the upper, contractile uterine segment bulging smoothly and symmetrically above the surface of the lower segment, strong, positive evidence exists that pregnancy is present. Diseased conditions of the uterus almost never result in its symmetrical enlargement, nor do they cause development of its lower segment.

Although the ovaries and tubes share in the hypertrophy which the uterus undergoes during pregnancy, still it is not often possible to outline them by vaginal examination. If the patient has complained of slight, irregular discharge of blood, her pregnancy being several months advanced, it is well to examine the rectum for the existence of hemorrhoids. The rupture of hemorrhoids in some cases of pregnancy gives rise to a discharge of blood which is erroneously believed by the patient to be menstruation.

During the examination of the patient to determine the size and shape of the uterus the physician will frequently apprehend one of the principal signs of pregnancy, namely, rhythmical contractions of the uterus. From the study of embryology, as well as observation upon the human subject, it is evident that such contractions proceed from the very beginning of pregnancy until the occurrence of labor. Their purpose seems to be to bring the long axis of the fœtus to coincide with that of the mother's uterus, and also, during the latter part of pregnancy, to bring the child to the brim of the pelvis and cause it partially to engage. They are exaggerated by any manipulation, and in sensitive patients may give rise to considerable suffering.

When pregnancy has advanced to four or five months, if the lower uterine segment be distended, or if, as in multigravidæ, it be possible to insert the finger into the cervix, the physician may elicit the sign called "ballottement." This is effected by pushing away from the finger the head of the child, floating in the amniotic liquid. If the finger be allowed to remain, the head will gradually descend in the amniotic fluid and fall gently against the finger-tip; this has long been considered a positive sign of pregnancy, although it sometimes gives rise to error. In hysterical and nervous patients, contraction of the recti and abdominal muscles may simulate rhythmical contractions of the uterus and occasion error in diagnosis.

Malformations of the uterus naturally confuse the physician and

cause him to make erroneous diagnoses; the most frequent of these is bicornate uterus, in which one-half of the womb may contain the child, the other half remaining empty and undeveloped. Examination in such cases fails to reveal the usual symptoms of pregnancy, but discloses what is apparently a small and empty uterus and immediately beside it a tumor, which, as pregnancy advances, may be recognized as a sac containing a living fœtus.

The period of gestation can be best computed by physical examination, which furnishes a far more reliable basis of judgment than do the statements of the patient. While the uterus has been accurately measured at various stages of gestation, the physician must carry in mind certain landmarks in the abdomen and remember the relation which the fundus of the uterus bears to these landmarks at various periods of pregnancy.

For estimating the period of gestation, the symphysis pubis, the umbilicus, and the tip of the sternum may be taken. The practitioner will do well to remember that the uterus cannot be felt rising distinctly behind the symphysis pubis until the third or fourth month of gestation. At the sixth month it is at the umbilicus; at the ninth month it causes the tissues beneath the tip of the sternum to be considerably distended; and at the termination of normal pregnancy it is to be found two or three fingers' breadth below the tip of the sternum and a little more than a hand's breadth above the umbilicus.

If it is desired to estimate the period of gestation more minutely by reference to the size of the uterus, it may be remembered that at the end of the first four weeks of pregnancy the uterus is slightly enlarged; at the termination of the second month of pregnancy the uterus is as large as a man's fist; at the end of the third month of gestation it is as large as a man's fist upon which is placed the expanded hand; at the termination of the fourth month it is as large as a fœtal head at term, and can be distinctly felt just above the brim of the pelvis; at the end of the fifth month it is two or three fingers' breadth above the brim of the pelvis, half-way between the symphysis pubis and the umbilicus; at the sixth month it is at the umbilicus; at the seventh two fingers' breadth above it; at the eighth a hand's breadth; at the ninth putting the tissues at the tip of the sternum on the stretch, and then gradually descending until, before labor, it is again a little more than a hand's breadth above the umbilicus. Experience in abdominal palpation will enable the obstetrician to form a very accurate judgment as to the period of gestation, and he may be able to correct an error in a patient's calculations of several weeks. On the other hand, it must be remembered that the exact period of gestation cannot in most cases be determined, and that errors of one or two weeks are by no means uncommon with good observers.

CHAPTER II.

THE DIFFERENTIAL DIAGNOSIS OF PREGNANCY.

In the foregoing chapter early pregnancy has been considered from the standpoint of diagnosis before the development of the fœtus is sufficiently advanced to permit a positive conclusion by hearing the heart-sounds or feeling or seeing the movements of the child. It can readily be understood that many other growths in the abdomen and pathological conditions of the abdominal viscera may occasion confusion and be mistaken for pregnancy. In attempting to differentiate between pregnancy and pathological conditions the practitioner should remember to conduct his examination in a methodical manner; he can hope to arrive at a correct conclusion by the exclusive use of no one method of investigation. Inspection of a patient, percussion, and auscultation, with careful mapping out of areas of dulness or tympany, must be resorted to if a correct diagnosis is to be made.

Among the most common abnormalities which occasion a suspicion of pregnancy is the deposit of fat in the abdominal wall; this condition often occurs in women past the most fruitful period of sexual life and who may earnestly desire offspring. They may experience many of the sensations which they have formerly felt or which have been described to them as peculiar to pregnancy. Their gradual increase in size in the abdominal region often persuades them that pregnancy really exists. As this condition is especially likely to occur just prior to the menopause, abnormalities in menstruation happening at this time strengthen the patient's belief in the existence of pregnancy.

In examining such patients it is well to remember that all nervous women are liable to a considerable accumulation of gas in the intestinal tract; this gas sometimes forms during an examination, and by distending the abdomen may considerably obscure a diagnosis. To appreciate the thickness of the abdominal wall it is necessary for the examiner to grasp the tissues between the thumb and fingers; in that way he can recognize the fact that the wall itself of the abdomen is enlarged, and not necessarily any of the viscera. When the fat is not firmly bound down by interlacing connective tissue it is often possible to obtain the sensation known as the "percussion-wave of fat;" this is often met with in women who have a deposit of fat not only in the abdominal wall, but also in the mesentery. It is to be obtained by placing one hand broadly upon the side of the abdomen and tapping quickly with the fingers the opposite side of the abdomen. This slight percussion-wave does not alter upon changing the position of the patient, as does the wave caused by fluid, and the wave-impulse is much less marked than is the case where fluid is present. It has been observed that just above the symphysis pubis the deposit of fat in such subjects is reduced to a minimum, and here it is frequently possible to

sink the fingers deeply into the abdominal wall and appreciate the deposit of fat in the surrounding parts.

In women who have borne a child repeatedly the abdominal walls may be very much relaxed, and a separation of the recti muscles may permit the protrusion of the peritoneum and mesentery between the separated tendons; this mass, however, is easily distinguished from the pregnant uterus. Tumors of the abdominal wall are of rare occurrence, and very seldom complicate the diagnosis of pregnancy. Abscess in the abdominal wall will be detected by the usual signs of a collection of pus, and the attention of the physician will have been drawn to its existence by the previous history of the case.

One of the most common pathological conditions of the abdomen which might complicate a diagnosis of pregnancy is ascites. Here, again, the observer may obtain a percussion-impulse caused by the ascitic fluid. On percussing the abdomen a somewhat clear or tympanitic note is usually found along the centre of the abdomen, while, as the patient lies upon her back, at the sides of the abdomen and in the flanks there is the marked dulness which tells of encysted fluid; the explanation of this phenomenon is found in the fact that while the patient lies upon her back the fluid gravitates to the sides of the abdomen, while the intestine, containing more or less gas, is displaced by the fluid and floats up into the centre of the abdomen. If, now, the patient be placed upon her side, it will be observed that the area of dulness upon the side on which she is lying will be largely increased, while over the remaining portions of the abdomen a clear or partially tympanitic note will be found.

Encysted dropsy, often tubercular in character, may occasion considerable confusion in diagnosis, as it may simulate very closely the pregnant uterus and its contents. Tubercular peritonitis, where adhesions form, shutting off a portion of the peritoneal cavity from the remainder, very closely resembles pregnancy in many respects.

Ovarian tumors are to be distinguished from pregnancy from the fact that in these cases, if the contents of the tumor are fluid, the examiner detects a distinct fluid-wave transmitted from one side of the abdomen to the other. He fails by palpation to outline the body of the fœtus, and by auscultation he is not enabled to hear the fœtal heart-sounds. Vaginal examination would show in such a case that the uterus had not increased in size. Where the tumor is both solid and cystic, careful palpation may sometimes be required to recognize the fact that the contour of the solid portion of the tumor is not that of the body of the fœtus. Failure to appreciate fœtal heart-sounds and fœtal movements after careful search for them will show that pregnancy is absent.

Floating kidney and spleen may occasion confusion in diagnosis by presenting a large, solid tumor in the abdomen. The fact that these tumors are entirely solid, the absence of fœtal heart-sounds, failure to find these tumors proceeding from and connected with the uterus, and the fact that they can often be replaced to their proper position in the abdomen, make a differential diagnosis not a matter of great difficulty. Tumors of the uterus itself may occasion a suspicion of pregnancy,

and may sometimes, by their presence, complicate an existing pregnancy. The growth and development of a uterus the seat of fibroid changes are, however, not usually symmetrical and smooth like that of the pregnant womb. In interstitial fibroids, while the surface of the uterus may be smooth, still the lower uterine segment remains undeveloped, and the contour of the fœtus cannot be outlined. Cancer of the endometrium may cause a symmetrical development of the uterus; but here, again, the lower uterine segment is absent, while upon palpation and auscultation it will be seen that the uterus is not in the pregnant condition.

Tumors from the periosteum of the pelvis, hydatids of the abdominal cavity, actynomix of the abdominal cavity, and malignant growth of the intestine and surrounding tissues may all complicate a diagnosis of pregnancy. In each of these conditions, however, the contour of the uterus is not that of pregnancy, and positive signs that gestation exists are found to be wanting.

Pregnancy may occur in a fibroid uterus, and in such a case a most careful examination is required to detect the fact. It will usually be necessary to examine the patient under an anæsthetic and to map out very carefully, if possible, the condition complicating the pregnancy.

Distention of the abdomen with gas has already been mentioned; this is often termed "false pregnancy" or "pseudocyesis." In these cases the solid fœtal body is absent on palpation, while the administration of an anæsthetic will cause the tumor to disappear.

In this connection it seems best to draw the attention of the reader to the fact that the impregnated ovum may lodge and develop outside the cavity of the uterus; this may occur in cases of twin pregnancy, in which one twin is developed within the uterus of the mother, while the other may lodge and grow in the Fallopian tube or in the abdominal cavity itself. While the subject of ectopic gestation will be considered in another portion of the book, still it is well to review the differential diagnosis of this condition at this point.

When a patient suffers from disordered menstruation or from irregular uterine hemorrhage, complaining of sharp, intermittent pain at one side of the uterus, while many of the subjective symptoms of pregnancy are present, a suspicion of ectopic gestation is justifiable. On examination the uterus will be found but slightly enlarged. In the early weeks of ectopic gestation the ovum will be found usually at one side of the uterus and in the pelvis, forming a tumor, elastic and ill-defined and sometimes boggy to the touch. The uterus can be demonstrated to be empty by the cautious use of a uterine probe or sound. In cases where rupture of the Fallopian tube has occurred the tumor may be found deeply situated at the sides of the pelvis or behind the uterus in Douglas's cul-de-sac. The impression given to the examining-finger is that of a boggy mass, indistinctly outlined. The uterus, again, is found in an abnormal position, being crowded out of its usual location by the tumor. The womb is empty, and the hemorrhage which often comes from it contains portions of decidua. In cases seen in advanced ectopic gestation, if the child be living, it may be outlined by palpation in the abdominal cavity, and its heart-sounds can be heard. Here, again, the uterus will be found developed but partially and containing the decidua characteristic of ectopic pregnancy.

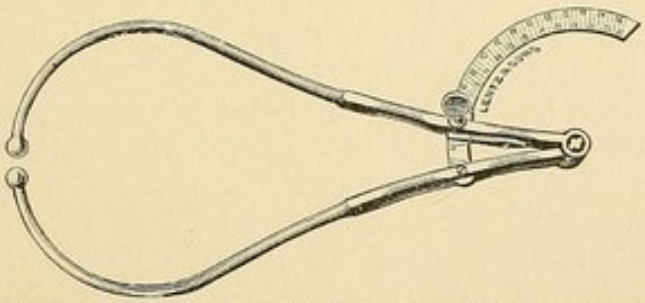
CHAPTER III.

THE DIAGNOSIS OF ADVANCED PREGNANCY—THE COMPLETE EXAMINATION OF THE PREGNANT PATIENT.

A POSITIVE diagnosis of pregnancy with living child can be made so soon as the existence of the fœtus is appreciable by sight, hearing, or touch on the part of the examiner. This becomes possible soon after the fifth month. It is not possible, however, to outline the position of the fœtus definitely before the period of viability is reached, which is from the twenty-sixth to the twenty-eighth week of gestation. In cases of pregnancy where no manifest deformity of the pelvis exists, the physician may defer his complete examination of the patient until the period of viability. He cannot, however, fulfil his duty if he omits such an examination at this period; the importance of the knowledge which may be gained by a thorough examination cannot be appreciated except by experience. To a physician who is accustomed to study his patient carefully, it is of the greatest assistance to know, when summoned to a case, with what sort of pelvis he is dealing; what is the position of the fœtus; what the comparative strength of the mother, and other details which are afforded by such examination. This information is obtainable without exposing the patient and without subjecting her to pain or to more than trifling inconvenience. We have yet, in our experience, to meet with objection from any intelligent woman to a reasonably conducted examination. In view of this experience, we cannot consider that the physician performs his duty to his patient if knowledge so obtainable is disregarded.

The instruments convenient for making a thorough obstetric examination are a pelvimeter, a stethoscope, and a tape-line. None of these is absolutely essential to a very useful examination, but a complete survey of the patient cannot be made without them.

FIG. 1.

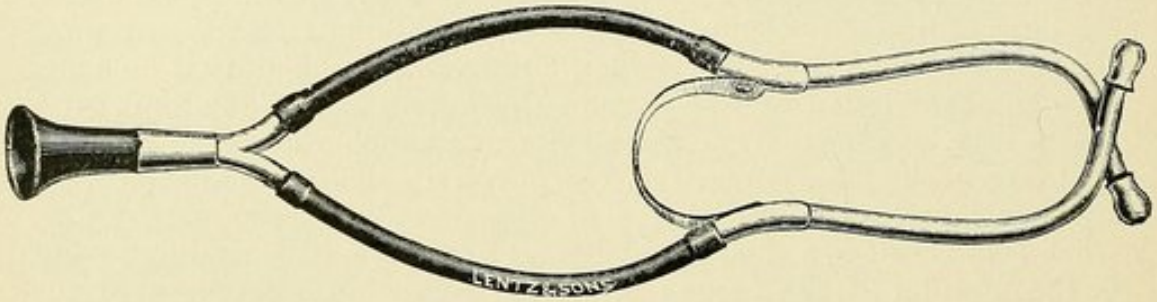


Pelvimeter. Scale in centimeters and inches. Can be taken apart.

An appointment may be made either to have the patient visit the physician's office, accompanied by a friend, or assisted by an office nurse, or the physician may call upon the patient at some convenient time. In either event the patient should lie comfortably upon a bed or table,

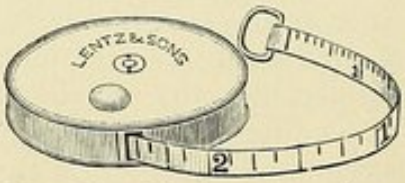
the surface of the body from the umbilicus to beneath the trochanters of the femora covered by one thickness of linen only. A sheet which has been repeatedly washed and perfectly pliable is best for this purpose. The physician will do well to wash his hands thoroughly in hot water, a procedure which will increase the sensibility of the hands and enable him the better to palpate the abdomen. It is proper and useful to explain to the patient the method of examination, the reasons for it, and the fact that it is of comparatively modern origin, and that she is thus enjoying the benefits of recent advances in medical practice. In very nervous women or ignorant patients it is well to show them the pelvimeter, and let them feel with the hands that it is not a painful instrument. Patients are relieved when informed that this procedure does not include a vaginal examination unless some unusual condition be present.

FIG. 2.



Light binaural stethoscope.

FIG. 3.

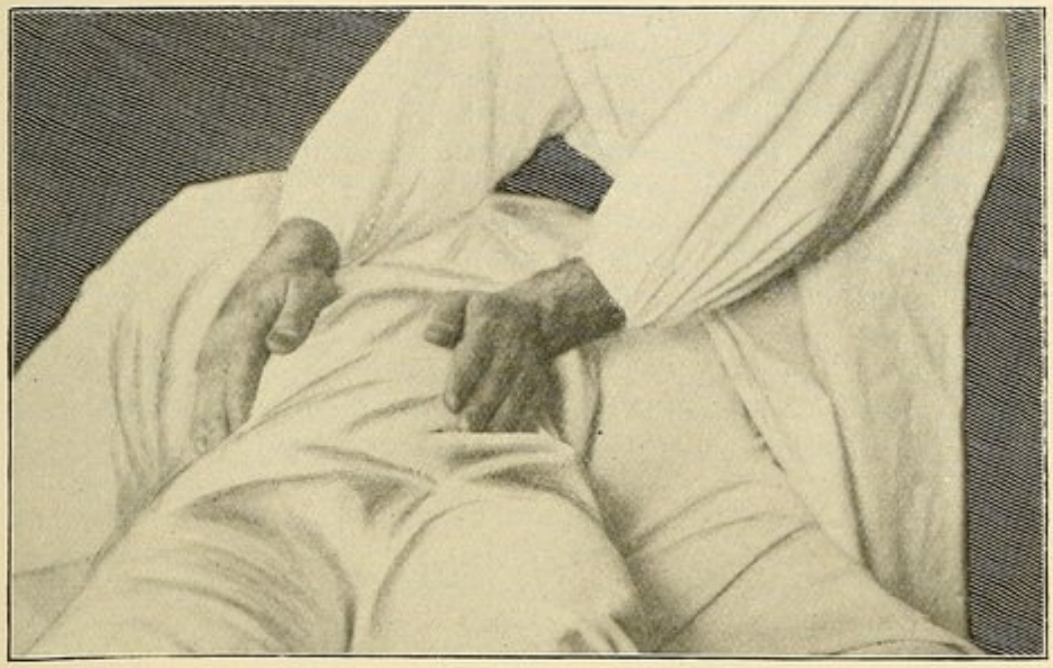


Steel tape-line, in inches and centimeters.

The objects of such an examination are, first, to determine positively the presence of pregnancy and the fact that the fœtus is living. The period of gestation is next estimated and the attitude and location of the fœtus ascertained. Very often the position of the placenta upon the uterine wall can be recognized. The presence of multiple pregnancy can usually be diagnosticated during this examination. The size of the mother's pelvis is also to be obtained, and the condition of the uterine muscle, the round ligaments, and the abdominal muscles is also observed. The examiner will be able to say whether the patient is a primigravida or if she has borne many children, by his examination. The relative size of the fœtus and the mother is also to be determined, and from the factors thus placed in the possession of the physician he may give an intelligent prognosis as to the patient's labor. The presence of large quantities of gas or hardened feces in the intestine should be noted. The entire examination, in the hands of one accustomed to make it, need not consume more than half an hour's

time, and the patient need not be put to serious discomfort nor made to suffer pain.

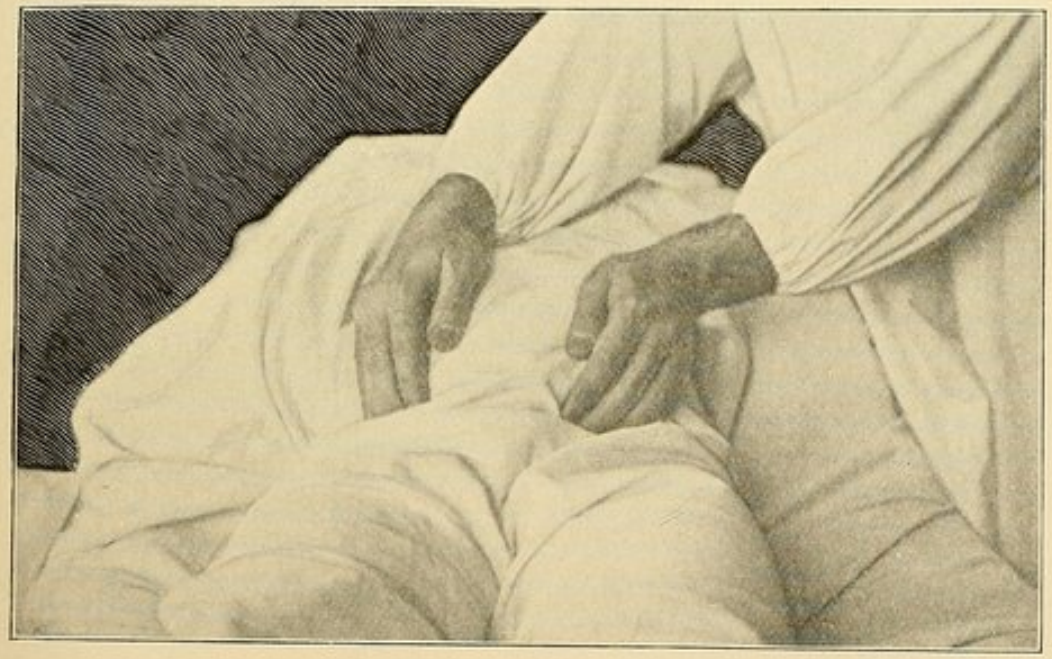
FIG. 4.



Palpating the body of the fœtus.

The presence of a living fœtus within the abdomen of the mother is to be determined by palpation and auscultation. To practise palpa-

FIG. 5.



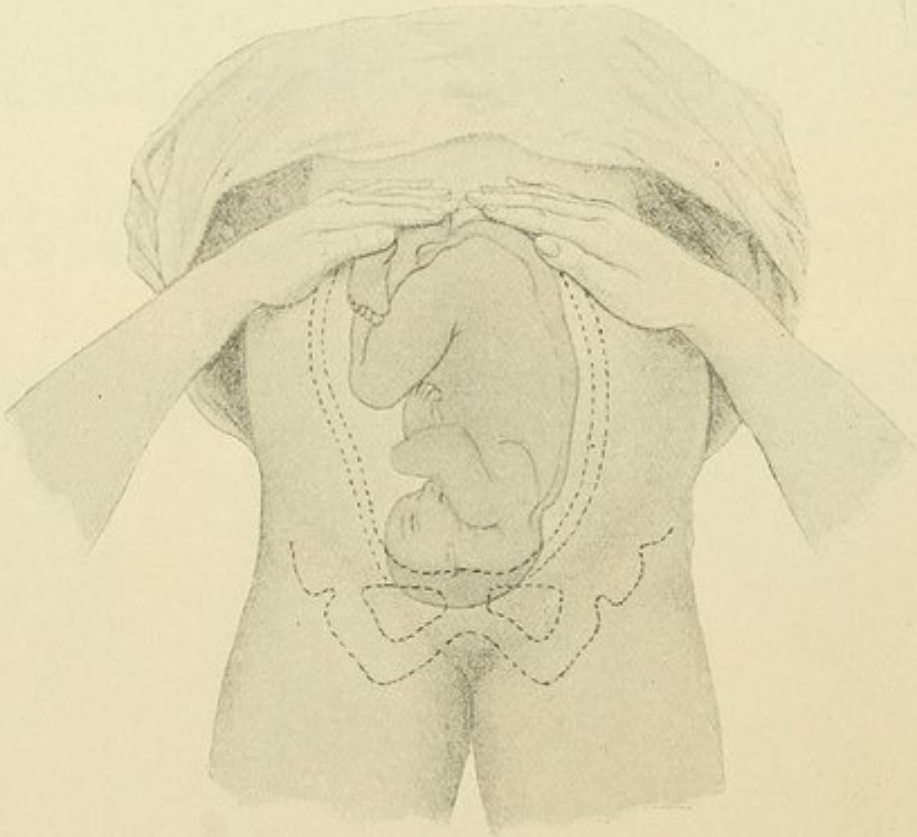
Palpating the presenting part.

tion the hands, recently cleansed with hot water and soap, should be laid broadly but lightly upon the abdomen of the patient, the physician standing with his face toward her feet. By gentle pressure with the

entire surface of the hands he will be able to recognize a cystic portion of the abdomen, on one side, and on the other a solid body whose long axis is usually parallel with the longitudinal axis of the mother's body. The cystic portion of the abdominal tumor is the fluid within the fœtal membranes, and should an unusual area of cystic tumor be found the diagnosis of polyhydramnios can be made.

By placing the finger-tips parallel with Poupart's ligament on each side, and carrying the hands gently but deeply into the pelvis, the presenting part of the fœtus can be appreciated. If both hands are moved together, first to one side and then to the other, the presenting part can be moved within the grasp of the hands in either direction. In normal pregnancy the head will be found at the brim of the pelvis ; the solid portion of the tumor or back of the child is directed obliquely upward and outward toward the mother's left side ; the amniotic fluid within the membranes is found beneath the right half of the mother's abdominal wall at the right upper portion of the abdomen with the limbs of the fœtus.

FIG. 6.



Palpating the breech.

During the palpation of the abdomen and mapping out of the fœtus the living fœtus will usually be felt to move beneath the hand of the examiner. Fœtal movements are of two kinds : One, a gradual bending of the fœtal trunk, resembling a peristaltic movement ; the other, the quick and often forcible movements of the child's limbs. If either of these be positively recognized, it furnishes positive evidence of the existence of pregnancy. These movements are occasionally simulated

by muscular contractions in the abdominal wall of the mother, and very rarely by marked intestinal peristalsis.

When a fœtus has been outlined in the abdomen of the mother the question next arises, Is this fœtus within the uterus or outside its cavity? Palpation alone will not give a positive answer to this question. In normal, entopic pregnancy, however, the fœtus in the great majority of cases lies in the uterus with its long axis parallel to that of the mother's body. In abnormal, ectopic pregnancy the fœtus lies transversely or obliquely in many cases. To determine positively whether a fœtus at term is within or without the uterus it is necessary to examine the uterus thoroughly by vaginal examination, and also by ascertaining whether its cavity is empty or whether it is occupied by a fœtus.

Auscultation of the abdomen should next be practised to determine the presence or absence of fœtal heart-sounds. In normal pregnancy these are best heard between the umbilicus of the mother and the anterior superior spinous process of the left ilium. If the sheet covering the patient's abdomen be drawn smoothly over the skin and a stethoscope be applied gently but firmly, heart-sounds can usually be heard without difficulty after the sixth month. Where the child is small and freely movable heart-sounds may be heard at any point over the abdomen below the umbilicus and to the left of the median line, and the pregnancy still be a normal one. The hearing of fœtal heart-sounds and feeling or seeing the movements of the fœtus give positive information that pregnancy exists. No other phenomena connected with pregnancy afford positive information upon this point.

When listening for fœtal heart-sounds the physician may hear a soft hissing or blowing sound, somewhat resembling the heart-murmurs observed in cases of anæmia, and heard most plainly immediately over the trunk of the fœtus. This sound is nearly as rapid as that of the fœtal heart, and is caused by a constriction in the vessels of the umbilical cord, resulting from the winding of the cord about some portion of the fœtus. It is often difficult to detect, but when observed points to the coiling of the cord about the child. In addition to the sounds made by the fœtus itself the physician will often hear, in the normal abdomen, gas within the mother's intestine, the beating of the abdominal aorta of the mother, and in the wall of the uterus the rushing of blood through the uterine sinuses at the site of the placenta.

The diagnosis of the location of the placenta may be more positively made in some cases by palpation. In women in whom the abdominal wall is thin and the uterine muscle relaxed it is possible to feel the edge of the placenta when it is attached to the anterior wall of the uterus. The sensation is that of a ridge or elevation in the muscular tissue of the uterus. The presence of the placenta also obscures palpation of the underlying fœtal members. Thus, when the placenta is attached upon the side of the uterus directly above the child's back it is difficult to outline the shoulder, and in some cases of breech presentation it may be difficult to define clearly the fœtal head. The presence of the placenta is a very considerable obstacle in auscultation, and fœtal heart-sounds are heard but faintly through placental tissue. In

cases where heart-sounds are indistinct the examiner should endeavor to detect the placental *bruit*, whose presence may explain the faintness of the fœtal heart.

The location of the placenta may also be diagnosticated by certain changes in the contour of the uterus, which are present when the placenta is attached near or opposite the orifices of the Fallopian tubes.

FIG. 7.

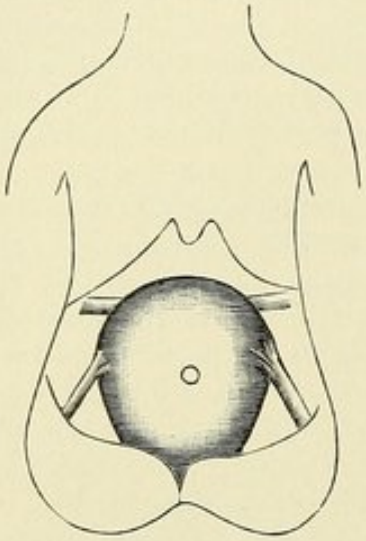


FIG. 8.

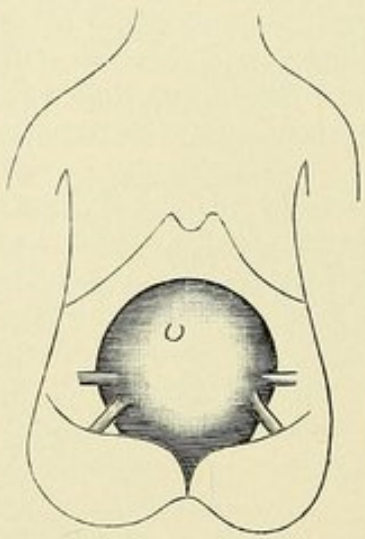


FIG. 9.

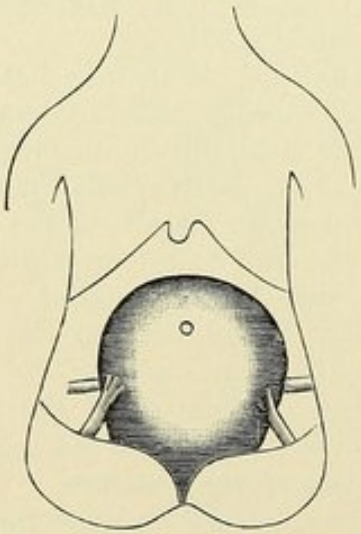
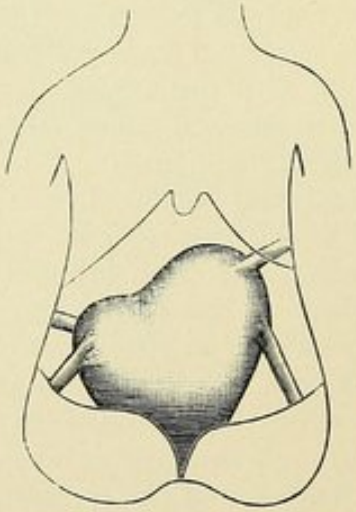


FIG. 10.



Variations in shape of uterus in different locations of the placenta. (PALM.)

It has been shown that when the placenta remains in one cornu of the uterus that its development in this location causes corresponding enlargement of that portion of the uterus and very much alters the shape of the womb from its normal ovoidal form. Not only does the location of the placenta in this region produce this result, but in many cases the placenta in this location is adherent to the wall of the uterus. When labor occurs the placenta in these cases is not expelled spontaneously, but must be removed by the hand of the obstetrician. It is a question whether the placenta lodges at the orifice of the Fallopian

tube, because of some pre-existing endometritis at this point, or whether the lodging of the placenta in this portion of the uterus sets up an irritation which results in its adherence to the uterine wall. The result, however, is practically the same, namely, that in cases in which the placenta remains in the cornu of the uterus adherence of the placenta may be feared when labor occurs. The changes in contour produced by this condition have been made a careful study, and may be summed up by saying that that cornu of the uterus in which the placenta lodges becomes enlarged and exaggerated in contour, so that the shape of the uterus is plainly evident to the touch and eye of the observer.

The practical value of diagnosticating the location of the placenta before labor is not appreciated in spontaneous births. In natural labor the placenta demands the attention of the obstetrician only to secure its entire expulsion. In cases, however, of low attachment of the placenta its location is a matter of great importance, not only because severe hemorrhage inevitably occurs when the placenta is very near the internal os, but because methods of treatment addressed to this condition are most successful when the obstetrician knows the location of the placenta and can apply his tampon or use his hand directly with reference to this condition. Where it is necessary to remove an adherent placenta much time may be saved and needless manipulation avoided if the physician can carry his hand at once to the placenta, instead of taking some time to find it within the uterus. In operative cases where delivery must be performed by abdominal incision the location of the placenta is of considerable importance. In a considerable proportion of cases from the writer's experience, in fully one-fifth a placenta was attached to the anterior wall of the uterus in such a manner that the incision for the delivery of the child must have come upon the placenta. There is no way of stopping a resulting hemorrhage except by quickly tearing through the placenta and emptying the uterus rapidly of its contents. If the operator is forewarned, he is much less likely to lose time or to be for a moment embarrassed by hemorrhage from the placenta. The diagnosis of the location of the placenta should certainly be made whenever possible, and especially in all complicated cases.

In ectopic gestation the location of the placenta is of paramount importance. It is almost impossible in many cases to remove a placenta which has become attached to the intestine, to the mesentery, or to the wall of the abdomen or pelvis, without fatal hemorrhage resulting. If the placenta can be diagnosticated as situated upon the anterior wall of the abdomen, the operator would be justified in avoiding the central line for his incision and in opening the abdominal wall at some point where he could extract the fœtus without necessarily separating the placenta. By stitching the membranes to the margins of the abdominal incision and tamponing the fœtal sac with iodoform-gauze the placenta will be gradually separated, and may be discharged later without serious bleeding. The location of the placenta in ectopic gestation is a matter of considerable difficulty, and can only be accomplished by palpation under an anæsthetic, and patient and repeated auscultation. In cases in which the fœtus has perished pathological changes in the placenta

have taken place to such an extent that hemorrhage is less to be feared than in cases in which the child is living. The diagnosis of the location of the placenta in ectopic gestation with dead fœtus becomes, then, of much less importance.

The location of the placenta is often of considerable difficulty in multiple pregnancy. Here the placenta is often so large, or two may be present, as seriously to embarrass the physician in his efforts to map out distinctly the contents of the uterus. In a patient having thin abdominal walls and a distended uterus a large, twin placenta may give the impression, on palpation, of the back of a small child ; while a joined twin placenta may so cover a small twin as to obscure completely evidence by palpation of its existence. As atony of the uterus is a frequent complication in multiple pregnancy, the location of the placenta is of practical importance, because the obstetrician will probably be required to remove the placentæ manually after the delivery of the children.

In women of frail physique, with thin and poorly developed abdominal muscles and relaxed uteri, the location of the placenta may become a source of considerable discomfort. If the placenta be attached below the umbilicus and above the lower uterine segment, its position need occasion no complications from hemorrhage. During the later months of pregnancy, however, it will form a considerable weight at that portion of the uterus, and may cause the contents of the womb to gravitate against that portion of the uterine wall, producing a bulging of the uterus at that point, with disagreeable sensations of weight and heaviness. In cases where the position and presentation are normal a large placenta attached above the lower uterine segment upon the left side of the uterus may bulge out the wall of the womb, and the combined mass of fœtus and placenta may press against the bowel, favoring obstinate constipation, and give the patient much discomfort. Similar trouble will be experienced where the placenta is attached below the umbilicus, but above the lower uterine segment upon the right side of the abdomen. The treatment for this condition consists in the use of a properly adjusted abdominal supporter. A patient is often more comfortable when employing an article of domestic manufacture than when wearing a more complicated and expensive form of bandage, many of which contain silk and rubber. The best material for such a support is flannel, and in cases where the patient is greatly troubled by laxity of the entire wall of the abdomen a body made of flannel and supported from the shoulders will often give great relief. It occasionally happens that in such cases the mother becomes apprehensive that the child has perished, because the placenta may be so attached as to obscure some fœtal movements ; the physician's examination is usually quite sufficient to dispel such anxiety.

To determine the period of gestation the physician observes the location of the fundus of the uterus. By reviewing the rate of development of the pregnant uterus we find that, clinically speaking, it becomes first appreciable on abdominal examination at the fourth month, when it can be distinctly felt at the brim of the pelvis. At the fifth month it is midway between the umbilicus and the pelvic brim ; at the sixth

month it is at the umbilicus ; at the seventh, two fingers' breadth above it ; at the eighth, a hand's breadth ; at the expiration of the ninth it has risen to distend the tissues beneath the tip of the sternum,

FIG. 11.

Locating the fundus of the uterus.

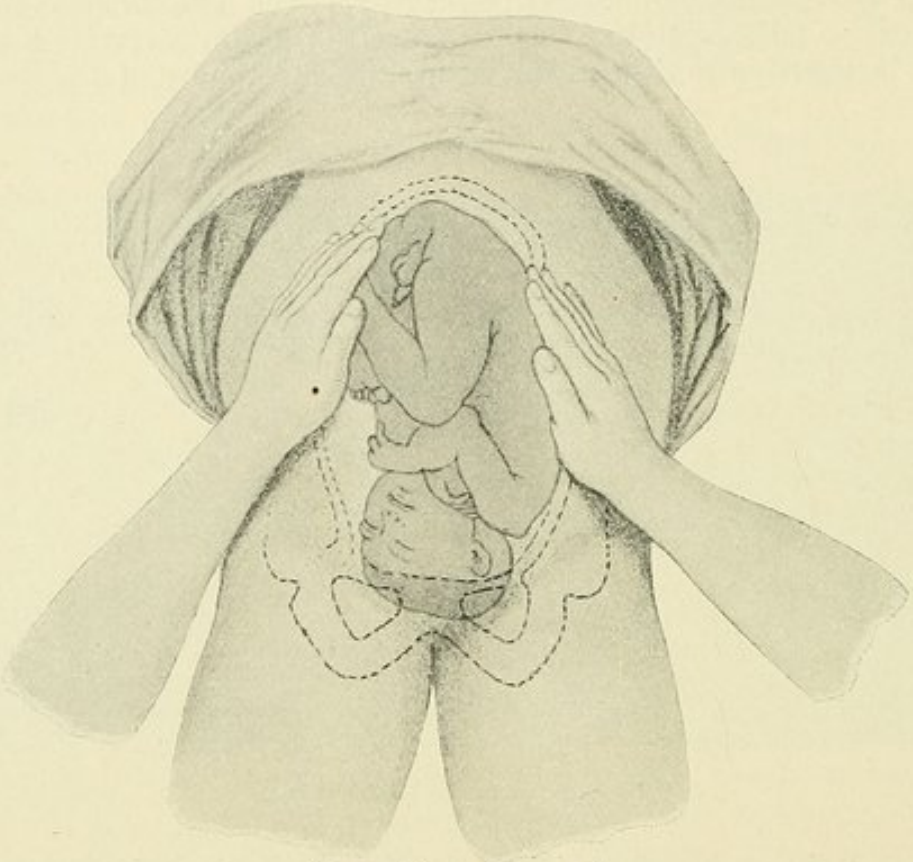
whence it descends before labor, until it is again a hand's breadth above the umbilicus. To one who is experienced in palpation of the abdomen in pregnancy the diagnosis of the period of gestation may be made more certainly than by computing the period from the date of the

FIG. 12.

Palpating the fundus of the uterus.

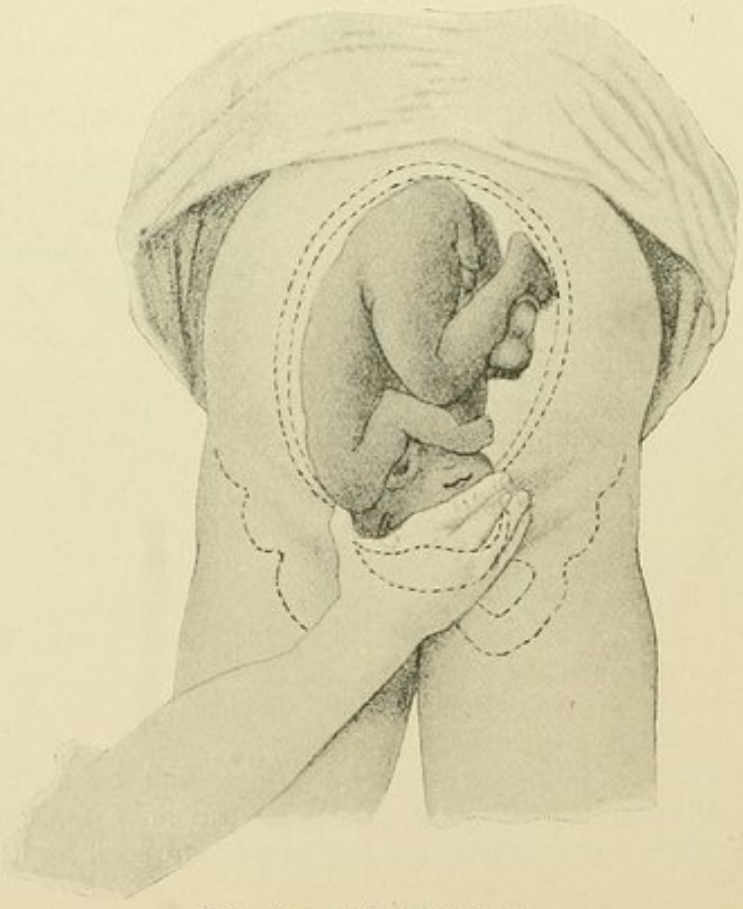
last menstruation. We have several times had occasion to correct patients' calculations by such examination, and have spared them unnecessary anxiety and expense in the cost of nurses, and, again, have

FIG. 13.



First position. (LEOPOLD.)

FIG. 14.

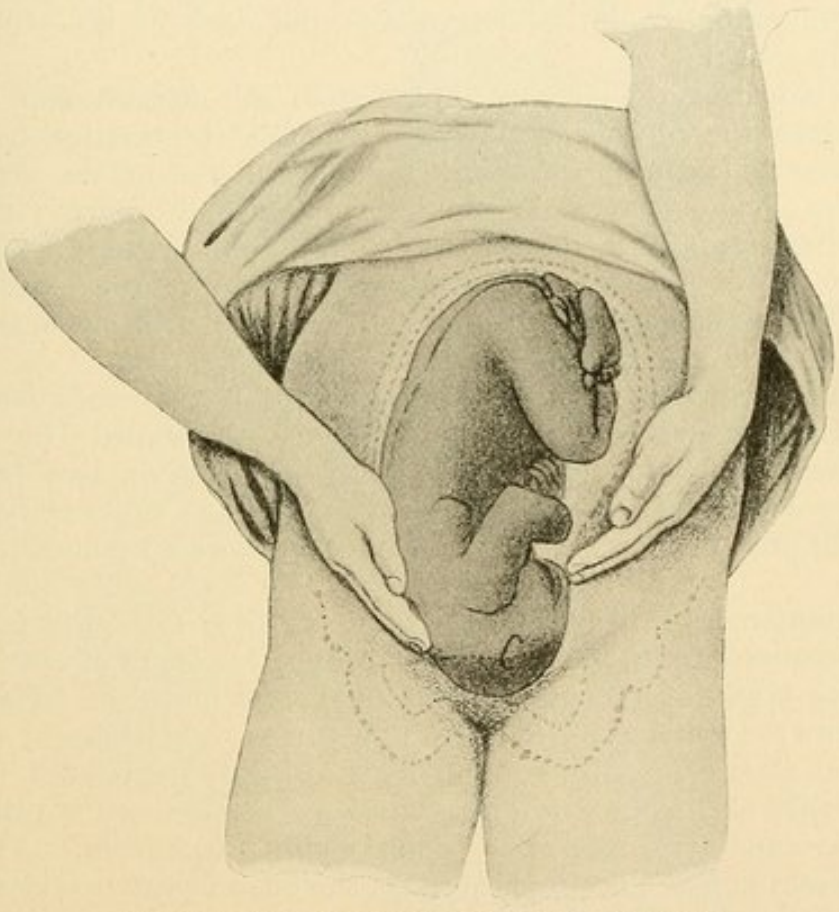


Second position. (LEOPOLD.)

directed them to summon the nurse and to prepare for confinement, which they had not expected for several weeks or a month or more.

For clinical purposes in the practice of obstetrics the fœtus occupies but two positions in the abdomen of the mother, namely, the first or usual one, when the back of the child is directed toward the left side of her body ; and the second, less common, when the back of the child is directed toward the right side of the uterus and abdomen. When the mechanism of labor is considered it will be seen that cases in which the presenting part does not rotate to the front may be more rationally considered as instances of defective rotation rather than as separate positions. The multiplication of positions of the fœtus is well exemplified in the French literature of obstetrics. Following the example of the French, early American teachers, educated abroad, adopted a nomenclature modelled upon theirs. Those who have studied obstetrics in German hospitals and are familiar with the German literature upon the subject appreciate the simplicity of the nomenclature which considers but two positions of the fœtus in the various presentations.

FIG. 15.



Second position, the beginning of labor. (LEOPOLD.)

The most usual position of the fœtus is outlined by palpation as that already described, in which the back is directed to the left side of the mother's abdomen, midway between the umbilicus and the crest of the ilium, the head being at the brim of the pelvis, the occiput directed to the left of the antero-posterior diameter of the pelvic brim, the knees

and feet of the child in the right hypochondrium, the upper extremities at about the level of the umbilicus and a little to the right of the median line.

In rare instances the back of the child lies upon the left side of the mother's abdomen, but directed toward the posterior wall of the abdomen. The head is at the brim of the pelvis, the occiput directed posteriorly to the transverse diameter of the pelvic brim, but toward the left side of the pelvis. In either of these cases the position of the fœtus may be called the first. The presentation when found, as described, by palpation, is occipital. In normal cases the attitude of the fœtus is that of universal flexion ; the head is flexed upon the trunk, and the limbs are also flexed and partially folded across the body. In patients in whom the muscular walls of the abdomen are thin this flexed position of the fœtal limbs may be distinctly outlined by palpation. In palpating the head the physician will notice that the smooth, rounded surface of the occiput points obliquely downward at the pelvic brim, and that between this and the trunk of the child there is a groove into which oftentimes the fingers may be pressed. When the fœtal head is but partially flexed, or is extended, this groove is partially or wholly obliterated, and the occiput and the back of the child seem practically continuous.

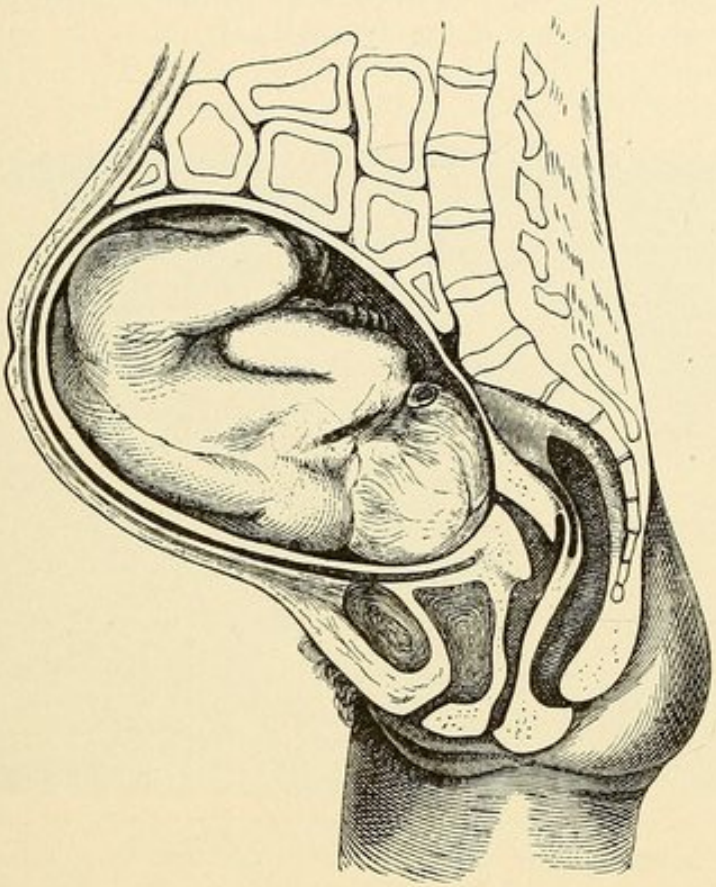
While palpating the abdomen to ascertain the attitude and location of the fœtus the physician may gain valuable information by noting the firmness or laxity of the uterine muscle and also of the abdominal walls ; the development of the round ligaments of the uterus ; the presence or absence of fat in the abdominal wall ; the degree of tension to which the uterine muscle is subjected, and the approximate size of the fœtus. The presence of an abdominal tumor in addition to the pregnant uterus may also be detected during such palpation.

Multiple pregnancy may be diagnosticated by palpation when two or more large fœtal parts may be distinctly appreciated ; by this we mean when two heads can be distinctly outlined, or two breeches ; when two heads and one breech, or two breeches and one head, can be mapped out, such a condition can only be caused by multiple pregnancy.

The question as to the primiparity or multiparity of the patient is to be determined by the manner in which she carries the fœtus and the firmness or laxity of the uterine and abdominal muscles. The primipara carries the fœtus lower in the pelvis during the last weeks of pregnancy than does the multipara. This is owing to the greater firmness and elasticity of the uterine and abdominal muscles in the primipara, which have not been weakened by previous pregnancies. Palpation will disclose the fact that the head is at the brim of the pelvis and has begun to fit into the brim, in the primipara ; when in the multipara, at the same period of gestation, the head can be found freely movable above the pelvic brim. The shape of the abdominal tumor is different in primiparæ and in multiparæ, in the former the uterus being pear-shaped or ovoidal, while in the latter the width of the uterus is greater and its outline less symmetrical.

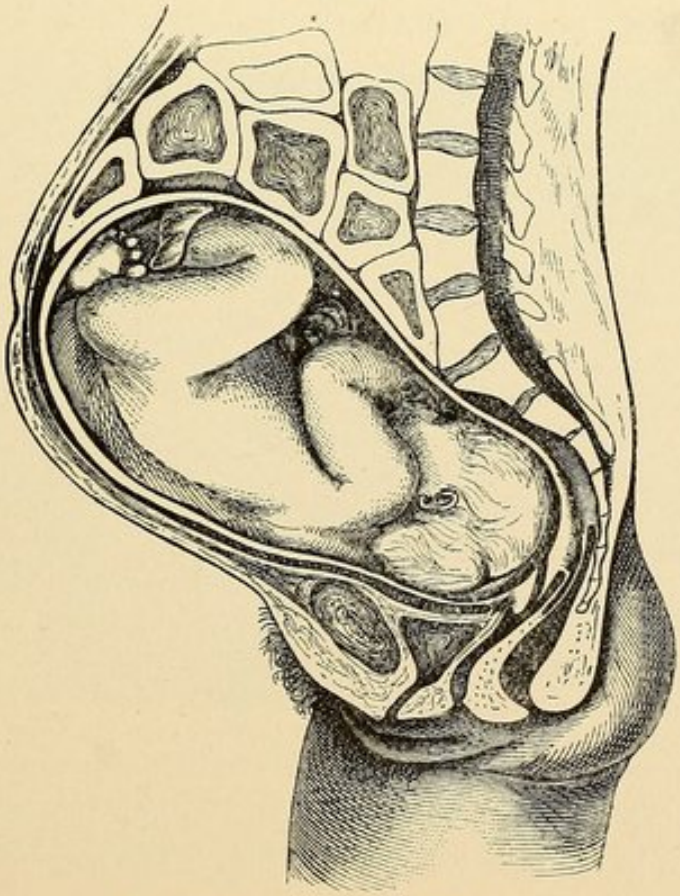
The round ligaments of the uterus may often be appreciated by

FIG. 16.



Fœtus in a multipara. (SCHROEDER.)

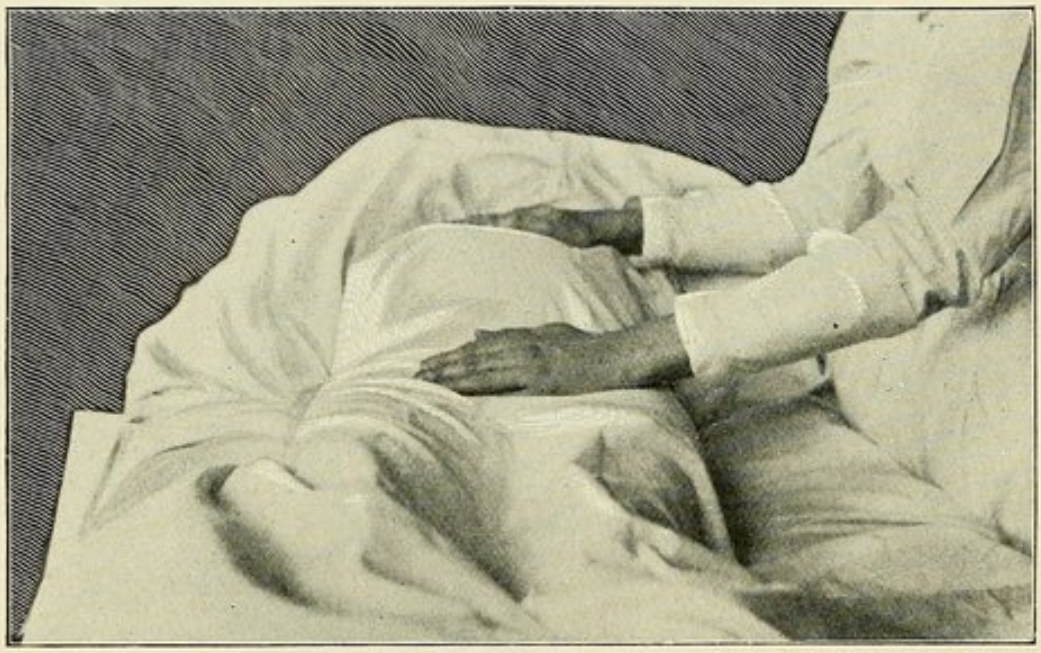
FIG. 17.



Fœtus in a primipara. (SCHROEDER.)

palpation, and their size and firmness may be taken as an indication of the muscular development of the uterus itself.

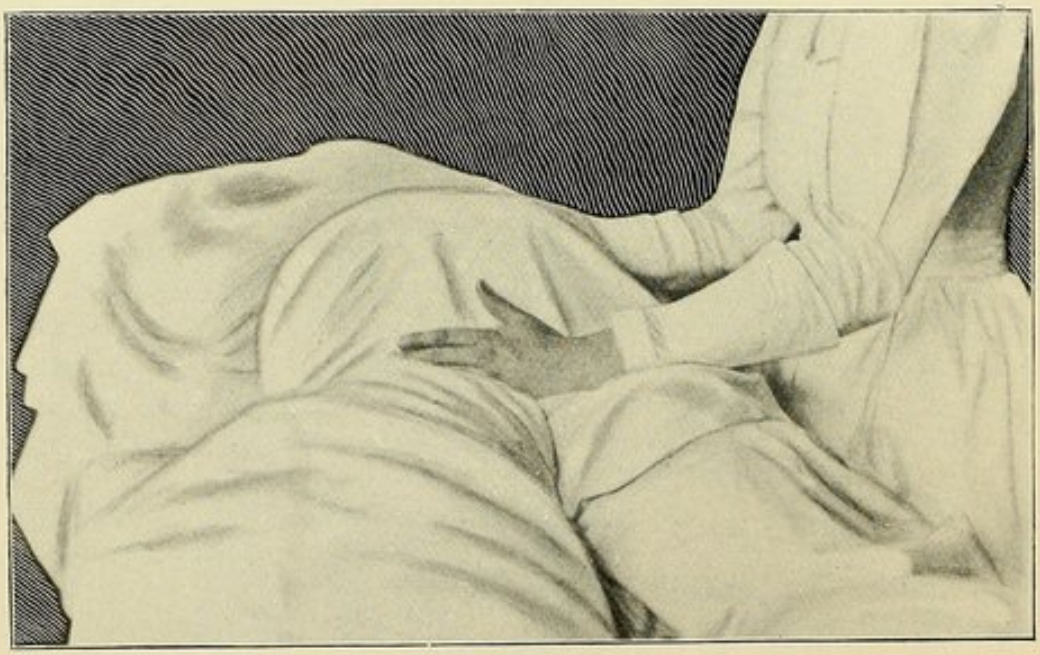
FIG. 18.



Shape of abdominal tumor in primigravida.

In estimating the size of the mother's pelvis a distinction is to be made between a critical examination of the pelvis from the standpoint

FIG. 19.



Shape of abdominal tumor in multigravida.

of the anatomist and such an examination of the pelvis as is possible to the clinician in the practice of obstetrics. The statements are often

made that American women rarely have contracted pelves, and that the practice of pelvimetry is not necessary except among women evidently the subject of disease of the skeleton, many of whom are of foreign birth. These statements are unfortunately incorrect; for while it is true that but few women of American birth, born amid the better hygienic conditions which have so far prevailed in America, have highly contracted pelves, it is also true that many American women of all classes of society have pelves differing from the normal size, and that these differences are sufficiently great to influence the course and the results of labor. It is comparatively easy to appreciate a high grade of pelvic contraction, but it is equally important for the interests of the patient that a minor degree of pelvic abnormality, which may result in fatal injury or death to the fœtus and injury to the mother, should be recognized before the actual beginning of labor.

The bony pelvis in the living patient presents a sufficient number of external landmarks, always accessible, to enable the obstetrician to determine the presence or absence of any important abnormality of the bony pelvis. These landmarks are the anterior superior spines of the ilia ; the widest points of the crests of the ilia ; the posterior superior spines of the ilia ; the spine of the last lumbar vertebra ; the middle of the anterior surface of the pubic joint, and the trochanters of the femora. These points may be utilized for pelvimetry, and from measurements so taken we become aware of the presence or absence of any abnormality necessitating a more critical examination.

The postures necessary for the patient to assume in order to permit such measurements to be taken are lying on the back, turning partially upon either side, and turning entirely upon the side for a few moments only. It is a familiar observation that pregnant women cannot lie flat upon the back with comfort ; the pressure of the pregnant uterus and its contents upon the spinal column and abdominal viscera seems to be such that the patient instinctively shifts the weight from one side or other of the spinal column. This tilting of the pelvis to one side, which renders her position upon a bed or table comfortable, need not embarrass the physician in the practice of pelvimetry. A little experience will enable him to outline the landmarks beneath the thin linen sheet which covers them, and so long as he is careful to keep with the eye the central line of the patient's body he need not be confused in making a measurement.

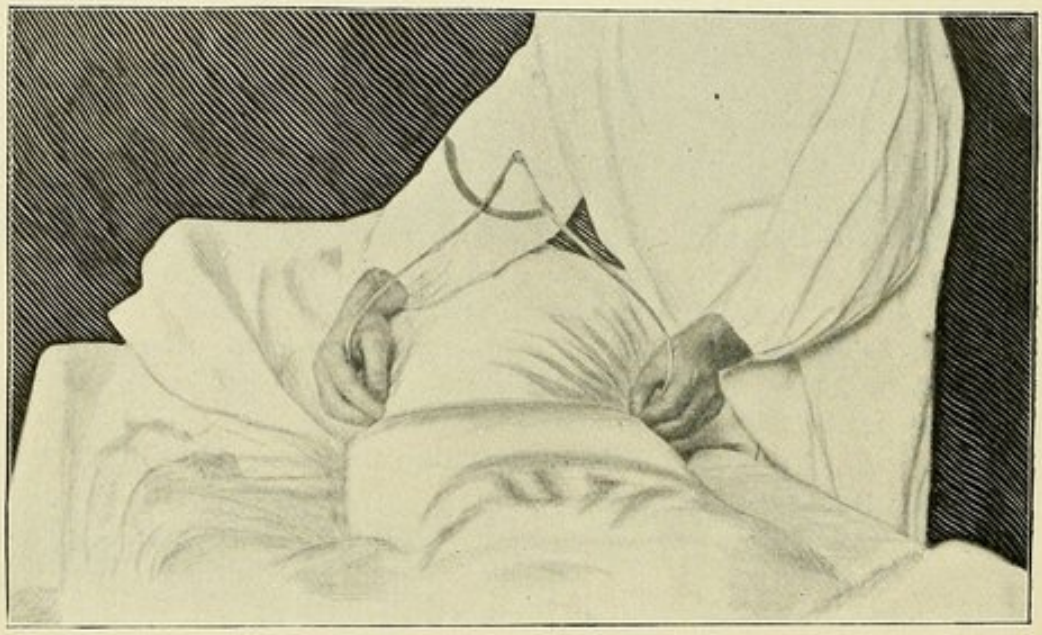
The obstetric pelvimeter is a pair of calipers with a scale graduated in centimetres or inches, or both. The important part of the instrument is the scale, which requires good workmanship. The curve of each limb of the pelvimeter should be sufficiently great to permit a measurement from the posterior iliac spine of one side of the patient's pelvis to the anterior superior of the other. The instrument should be made of well-tempered steel, nickel-plated, and should be made to take apart for convenience in transportation.

In practising pelvimetry the physician grasps the pelvimeter in such a manner that his thumb and finger rest just above the termination of each limb of the pelvimeter. He should remember to take his measurements from the outer side of each landmark upon the ilia. There is no

good reason for this injunction, except the fact that such is usage, and that the measurements given by those who have examined large numbers of pelves are measurements obtained in this manner.

The distance between the anterior superior spines of the ilia is found to be, in the average pelvis, 26½ cms. or 10 inches ; the distance between the outermost points of the crests of the ilia is 28 cms. or 11 inches ; between the trochanters is normally found to be 32 cms. or 13 and a fraction inches. These are measurements giving the width of the pelvis, and the relationship existing between them is of practical importance. Thus, in cases where the proportion between the first two measurements is lost or is reversed further examination will show that disease of the skeleton is present.

FIG. 20.



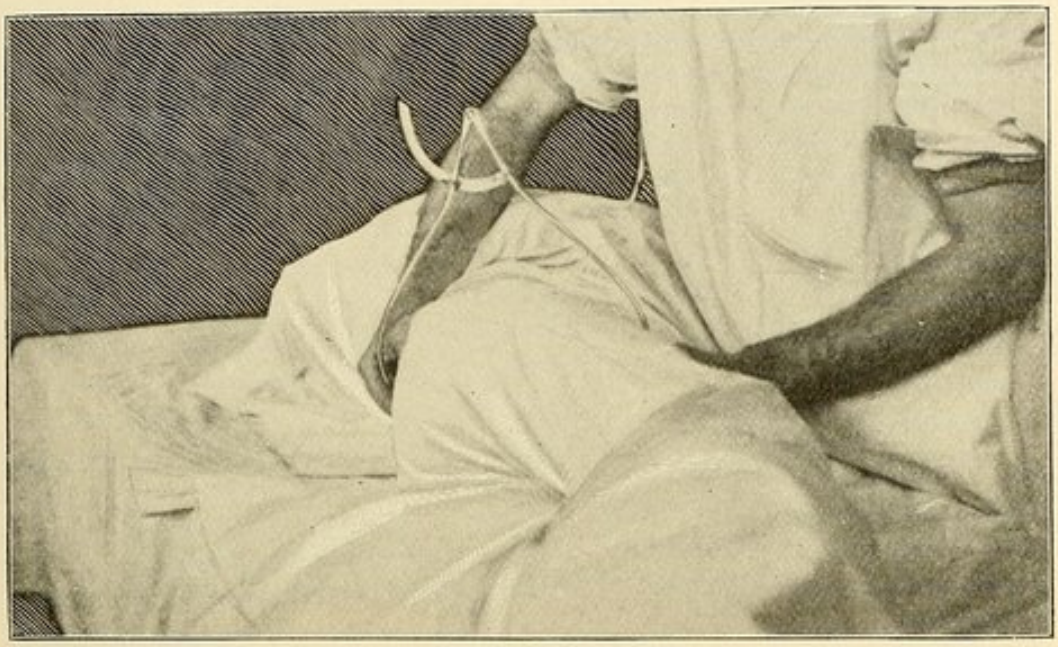
Making transverse measurements of the pelvis.

The oblique measurements of the pelvis, which may be made upon the living patient, are taken from the posterior superior iliac spine of one side to the anterior superior iliac spine on the other. There is normally a slight difference in these measurements, owing to the fact that the right oblique diagonal of the bony pelvis is often a little larger than the left. This diagonal—the right oblique—normally measures from 22 to 23 cms., while the left, from the left posterior superior spine of the ilium to the right anterior superior spine, measures 22 to 22½ cms., or 8¾ inches. To make the oblique measurements at the brim of the pelvis the patient should lie, not upon the back, but turned, raising slightly the side whose oblique measurement is desired. Even in fat women it is possible to outline these landmarks sufficiently plainly to enable the measurements to be taken.

The external conjugate of the pelvis, sometimes known as Baudelocque's conjugate, is measured from the depression beneath the spine

of the last lumbar vertebra to the middle of the anterior surface of the pubic joint, 20 cm. or 8 inches. The circumference of the pelvis is to be measured by passing a tape-line about the patient, passing the measuring-line about the middle of the pubic joint, just below the crests of the ilia, and across the upper portion of the sacrum behind; this measures normally from 85 to 90 cms. If the measurements just described are taken and found to be of average extent, it may almost certainly be concluded that the pelvis is of average size.

FIG. 21.



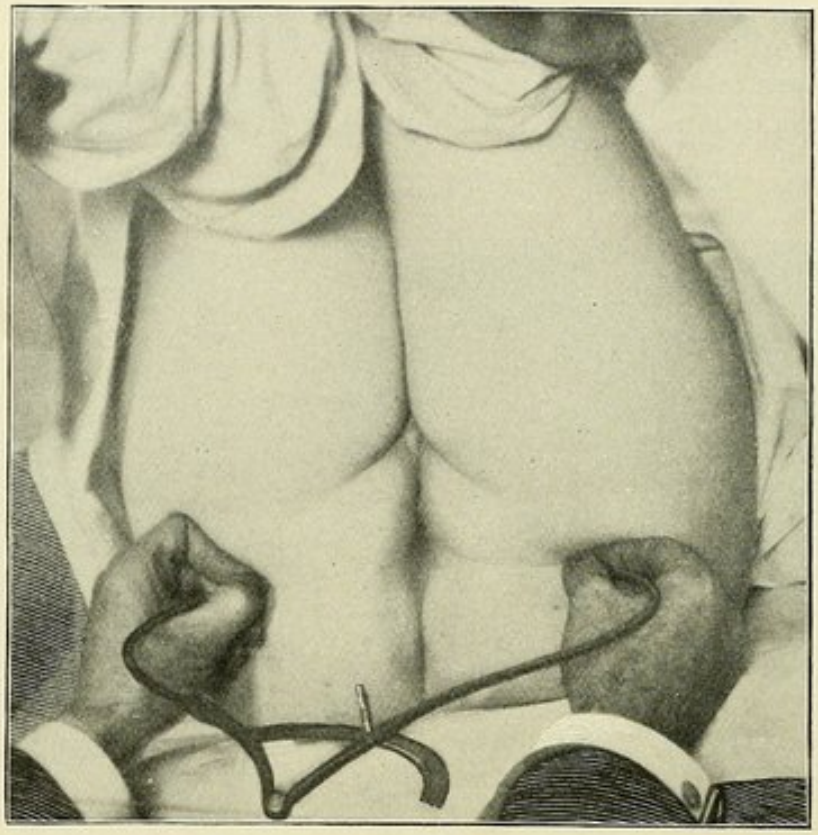
Measuring the external conjugate.

Cases are sometimes met with in which a transverse contraction in the outlet of the pelvis occasions delay and difficulty in labor. The most important transverse diameter at the pelvic outlet is the distance between the tuberosities of the ischia. This distance can be measured by external examination by placing the patient upon her back at the edge of a bed or table and having her legs and thighs flexed and supported by an assistant. If help is not available, the patient may simply bend the lower extremities, resting her heels upon the bed. The physician then measures across between the tuberosities of the ischia, which can be readily located by pressing the thumbs firmly against these bony landmarks. The distance thus obtained gives an excellent indication of the transverse width of the pelvic outlet.

The sacro-coccygeal joint in most patients permits of backward motion of the coccyx, which enlarges the outlet of the pelvis in its antero-posterior diameter from one-half to three-fourths of an inch. In middle-aged women and in patients in whom the process of ossification takes place early and to a considerable degree the mobility of this joint may be much impaired or lost. In contracted pelves the coccyx may be carried further forward than is normal, and the result be considerable difficulty in the extraction of the child at the pelvic floor.

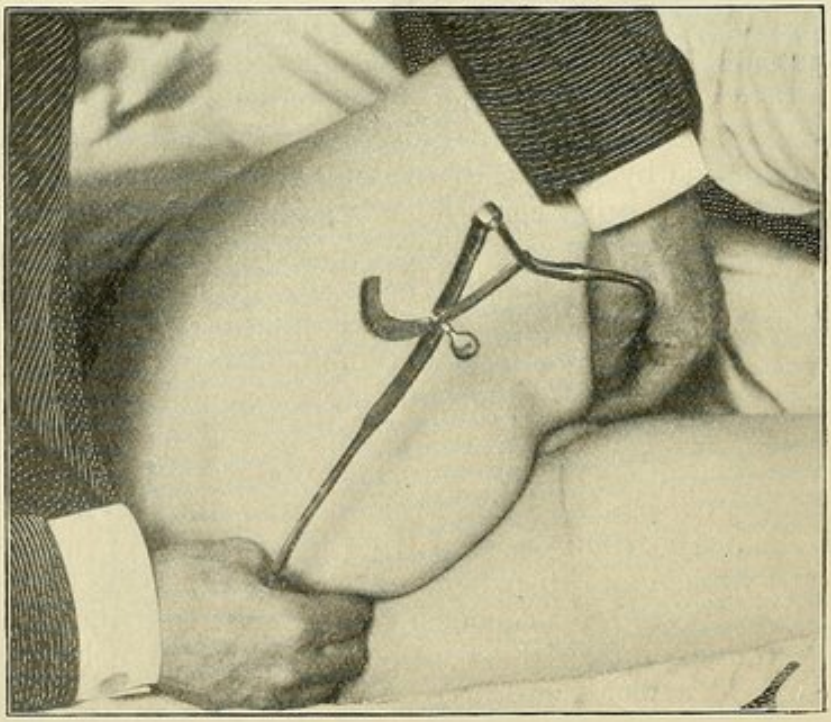
In cases where pelvic abnormality is suspected the physician should obtain this measurement by turning the patient upon the side and by

FIG. 22.



Measuring between the tuberosities of the ischia. Legs of patient raised by an assistant.

FIG. 23.



Measuring from pubes to coccyx.

measuring from the lower edge of the subpubic ligament to the sacro-coccygeal joint with a pelvimeter. The subpubic ligament in most patients is so large and firm that its edge presents a distinct ridge beneath the pubis, and can be readily found. To locate the coccyx it is but necessary to follow down the sacrum in the cleft between the nates, when the coccyx can be readily found.

Measurements of the pelvic outlet are rarely necessary in cases in which the measurement of the pelvic inlet reveals no abnormality. If the sacro-coccygeal joint be ankylosed, the condition cannot be remedied before labor, and in delivery with forceps the ankylosis will yield during the extraction of the fœtus. If the coccyx should be found bent strongly upward and forward, and fixed in that position, its removal would be justifiable during pregnancy. It is rare, however, for any complication to result from injury to this joint during labor.

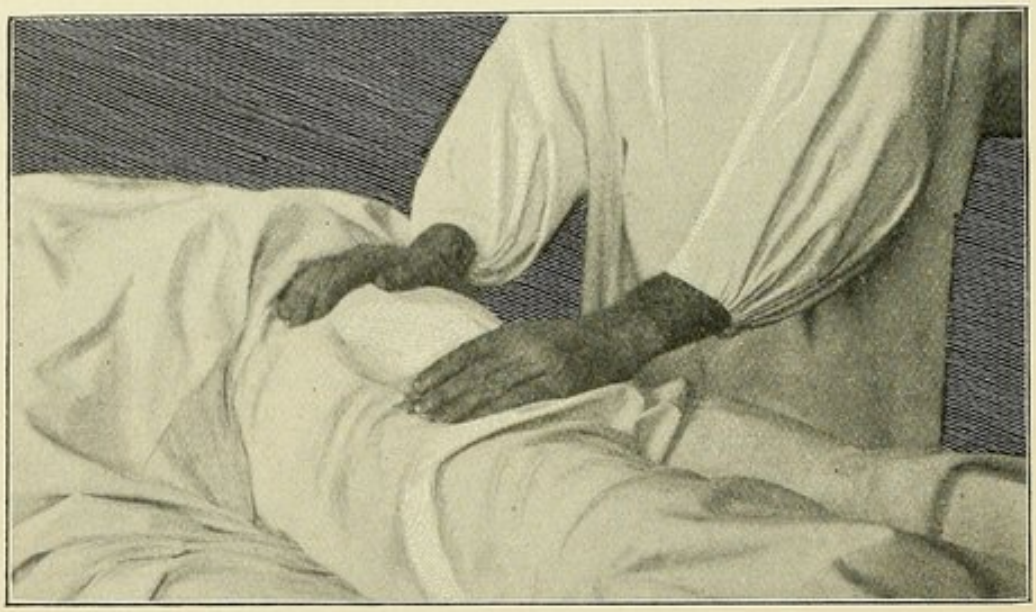
It would be of great value to the obstetrician to determine by external examination, or by any method of direct measurement, the actual capacity of the pelvis. This, however, cannot be satisfactorily done by any method of examination which is practicable in the ordinary experience of obstetric work. The presence of any abnormality in external measurements justifies the physician in making a thorough internal examination. If he has had experience in such examinations in patients who are not pregnant, he has had occasion to become somewhat familiar with the contour of the normal pelvis. An observant physician will at once appreciate marked abnormalities in a deformed pelvis by palpation through vaginal examination. The important measurement of the antero-posterior diameter is readily made in contracted pelves, and gives the most important data to be thus obtained. Lateral and oblique contractions of the pelvic cavity can be appreciated by the hand of an experienced observer, but cannot be accurately measured. Fortunately, indications for treatment cannot be based upon a given number of inches or centimetres, while sufficient information can always be obtained regarding the size and contour of the pelvis to afford a safe and logical basis for a practical decision.

The absolute size of the pelvis is not, however, the problem which engages the attention of the practical obstetrician. He is most concerned in knowing what is the relative size of the fœtus and the pelvis of the mother. By palpation he learns the attitude and location of the fœtus, and is able to ascertain that it is not excessive in size nor developed as a monstrosity. By pelvimetry he ascertains that the mother's pelvis is of the average dimensions and symmetrically developed. During this examination he has had abundant opportunity to inform himself regarding the muscular development of the mother, the strength and elasticity of the uterus and abdominal walls, and the presence or absence of any pathological condition in the abdomen which would hinder delivery. There remains for the physician a final investigation as to the relative size of the fœtus and the mother. If the fœtus be found in its presenting part proportionate in dimensions to the mother's pelvis, this fact, together with the knowledge just described, will enable the physician to make a prognosis regarding the labor. Where all factors in the problem are found to be normal the

conclusion is certainly justified that a normal labor, or one very closely approaching it, is to be expected.

To ascertain the relative size of the fœtus and the pelvis the presenting part of the fœtus should be gently but firmly fitted into the pelvic brim by pressure applied to the fundus of the uterus, and at the same time by pressure exerted upon the presenting part. The physician may take the presenting part, usually the head of the fœtus, between his hands, in the manner already described in palpation, and carry it gently downward and backward until he finds it beginning to fit into the pelvic brim. He may also stand facing the patient, and, taking the head in the right hand between the thumb and fingers, he places his left hand upon the fundus of the uterus. While he carries the head downward and backward with the right hand, with the left he brings the uterus gently downward toward the brim of the pelvis, thus favoring the engagement of the presenting part.

FIG. 24.



Fitting the fœtus into the pelvis.

With either method the results are sufficiently striking to one who practises such examinations to be of great interest. In cases where no disproportion exists the head comes readily to the pelvic brim, and under gentle pressure fits gradually within the brim of the pelvis with but little inconvenience to the mother. Where relatively slight disproportion is present the head does not easily enter the pelvic brim, but the right parietal bone moves downward and forward, the head remaining transversely at the pelvic brim. In marked disproportion between the pelvis and the head, the head remains unmistakably above the brim of the pelvis, and, if pressure be continuous and forcible, the head turns with a partial rotation to one or other side, the fœtus finally lodging upon the brim of the pelvis or in one iliac fossa. In cases where slight pelvic contraction is diagnosticated, if the patient be excessively nervous and complains of pain under any manipulation, it

is better to anæsthetize her and thoroughly ascertain the relative size of the fœtus and the mother rather than allow the case to go on.

The prognosis regarding the labor should be always guarded, as stated to the patient; if no abnormality be detected, there can be no objection in saying to her that no reason is found for apprehension regarding her confinement; where, however, some abnormality is discovered, it is well not to alarm the patient by stating this to her until the physician has decided whether he intends to interrupt the pregnancy. If this be necessary, it can be stated to the patient that it is best, in the interests of the child, that labor come on.

In general, in conducting such an examination, it should be remembered that a distended bladder may often greatly interfere with palpation and lead the examiner into serious error. A large accumulation of feces in the lower bowel is less likely to cause a mistake, although it is an unfavorable condition for an accurate examination. In selecting an anæsthetic bromide of ethyl or chloroform is often to be preferred to ether. While anæsthesia is very rarely necessary, yet there should be no hesitation in putting the patient under the influence of a suitable anæsthetic rather than attempt to make the diagnosis without suitable examination.

In completing the physical examination of the pregnant patient the physician will not discharge his duty unless he has carefully investigated the quantity of urine passed, its composition, and also the amount of solid excreta which the patient voids. To ascertain the quantity of urine passed, in hospital practice nurses in attendance can easily supply the requisite information; with private cases it is best to choose some common utensil whose capacity is known and to have the patient report from time to time the quantity of urine passed in twenty-four hours, using this as a measure. The examination of the patient's urine should be so conducted as to give information regarding its color, reaction, specific gravity, and the presence or absence of albumin, sugar, urea, pus, blood; by microscopic examination the presence of casts and their variety, the presence or absence of bacteria, and any other solid ingredients of the urine should be carefully noted. It is also of great practical importance to estimate the amount of urea and of solids which is excreted. A detailed account of the methods of clinical investigation which have been most successful in making such an examination of the urine will be given in that portion of the book treating of the toxæmia of pregnancy and its treatment.

When the physician has the co-operation of a trained and intelligent nurse he may request her, at the patient's convenience, to inspect carefully the breasts and nipples. A well-trained nurse who has had experience in obstetric practice can accurately ascertain the shape, size, and consistence of the breasts, the presence or absence of fluid in them, and the shape, development, and condition of the nipples. A prognosis cannot be given regarding the puerperal state and the welfare of the child unless a careful survey of the breasts is made. In the absence of such assistance as that rendered by a nurse the physician should not omit this portion of the examination, but conduct it carefully himself.

During the half or three-quarters of an hour occupied in the examination of the patient just detailed an intelligent physician will have gained information of the greatest practical value regarding his patient, and will be far better prepared to assume her care during labor and the puerperal state than if he were not in possession of such information. We have yet to find that such a procedure is objected to by any but the most ignorant patient; on the contrary, among intelligent women it often serves to impress the patient with the knowledge and cleverness of her physician, and to increase the confidence which, in her condition of timidity and apprehension, the pregnant patient naturally desires to feel in her attendants.

Obstetric Diagnosis by the Application of the Röntgen Rays.

The recent discovery that objects ordinarily considered opaque may be reproduced in outline by the action of the Röntgen rays upon a photographic plate offers interesting possibilities in obstetric diagnosis. While much of the apparatus necessary for this work is expensive and complicated, it may be so simplified that large hospitals having an electric-light apparatus may readily fit up a room in which this method of study can be utilized. The apparatus required consists of eight to a dozen storage-cells, each having an electromotive force of about two volts and a capacity of about 150 ampère-hours. The electric force required should be sufficient to give a spark six inches long between the points in air at the breaking of a primary current; this current should be passed through an inductorium or coil 14 inches long and 8 inches in diameter. An electromotive force of from 12 to 15 volts is that usually required. It will be readily seen that a current used by a city for lighting-purposes cannot be directly connected with the coil, the force being much too great. A shunt of some sort must be introduced, and this is the purpose of the storage-battery.

A suitable current having been obtained, a most essential part of the apparatus is the vacuum-tube, commonly known as a Crookes tube. This consists of a vacuum-tube of glass, into which are inserted four aluminum electrodes, one of which is a straight wire, the other a flat disk, preferably of platinum. The most efficient electrode for this purpose is the cathode formed by platinum wire projecting into the bulb. When the current is so arranged that this electrode becomes cathodal the surface of the tube is phosphorescent and gives forth abundant rays. If the object to be studied is placed from 12 to 18 inches from the tube upon a photographic plate, perfectly sealed in a pasteboard or wooden holder, the rays permeate the object and the plate-holders, throwing a shadow of the impermeable portions of the object upon the photographic plate. For successful working of the apparatus a high vacuum must be present in the tube. Some think that uranium glass is the best material for the construction of the tube, while it is generally agreed that the thinner the wall of the tube the better the results obtained. Different observations show that penetrating power is sometimes gained by the use of a leaden diaphragm,

PLATE I.

Pelvis and Fœtal Skull, taken with Röntgen Rays.

and that results vary in proportion to the nearness of the object to the tube employed, the electromotive force, and the vacuum in the tube.

The time necessary to procure a picture varies greatly. An hour has been necessary in some cases, while from a few minutes to fifteen or twenty have given excellent results in others. The time required seems proportionate to the thickness of the object, the vacuum in the tube, and the electromotive force.

The application of the plate to the patient is necessary in studying the trunk of the body; thus, in observing the pregnant womb the plate in its holder should be bandaged upon the abdomen of the patient, as near to the fœtus as possible. In ordinary positions and presentations the plate should be applied to the left side of the mother's abdomen, as near to the brim of the pelvis as possible. The patient should lie upon a suitable table or bed, her abdomen covered by a sheet only. The vacuum-tube should be placed as near the right side of the abdomen as possible, the plate being applied upon the opposite side. An exposure of an hour has sufficed, in the writer's experience, to give an outline of the body of the fœtus within the womb of the mother. The knowledge of the position and presentation so obtained was subsequently verified at the time of labor and found to be correct.

In diagnosticating the position of the fœtal head difficulty will be experienced in passing the rays through the bony pelvis if the head has entered the pelvis. This, however, is of secondary importance, as those cases in which the head can enter the pelvis are not those which occasion anxiety or especial difficulty in labor. (Plate I.) It will soon be possible to place the patient upon a large plate and obtain a picture of the pelvis and its contents.

The photographic plates are developed in the ordinary way, and the best results are obtained by the most sensitive dry plates. The time ordinarily required for the development of such a plate is from fifteen to thirty minutes, and the entire time necessary to secure a picture of the contents of the uterus varies from three-quarters of an hour to an hour and a half. The writer was unable to observe that the passage of the rays through the uterus had the slightest effect on mother or child, the mother's pulse remaining unaltered and the child showing no evidence of disturbance.

It is evident that this method of study, when applied to the pregnant uterus, would be especially useful in cases of multiple pregnancy, of pregnancy complicated by tumors of the abdomen, and of pregnancy in highly contracted pelves, where it is impossible for the head to enter the pelvis. The apparatus required would limit this method of investigation to hospitals, where it should prove of valuable aid in clinical work. The accompanying illustration of a bony pelvis containing a fœtal skull will illustrate the varying resistance shown by bony tissue of different thicknesses in the pelvis.

While the method of photography by Röntgen rays is of great interest, it would be far more important if the physician were enabled to inspect the body of the patient directly without the delay and trouble of the photographic process; this is possible by utilizing one of several substances possessed of highly fluorescent properties. The first of these

to be employed was the cyanide of platinum and barium. It was found by several observers that a sheet of cardboard covered with crystals of this substance and brought near a vacuum-tube in action became fluorescent, showing the effect of the rays and enabling an object interposed between the vacuum-tube and the cardboard to cast a shadow appreciable to the eye. This property of the substance described was utilized in the discovery of this method, and has since been employed by later investigators. It has also been found that tungstate of calcium and cyanide of platinum and potassium give even better results than the cyanide of platinum and barium. A convenient form of apparatus for this purpose consists in a single or double tube, resembling a telescope or opera-glass, which the observer can apply closely to the eyes, and, placing the object to be inspected between the vacuum-tube and himself, by looking fixedly he can obtain shadows of its least permeable tissues. The portion of the apparatus containing the fluorescent substance is simple and very easy of construction, the expense being chiefly in the fluorescent salts employed. It seems almost certain that manufacturers of electric apparatus will be able to devise a simple and inexpensive form of vacuum-tube and coil, so that the outfit required for such work may be brought within the reach of the average hospital or of the physician who can obtain the current from lighting or heating companies.

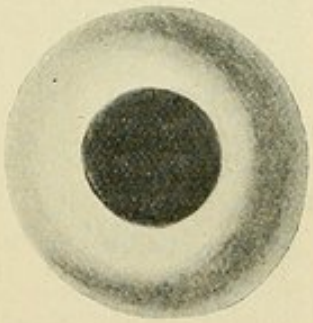
FIG. 25.

Sketch of living infant's foot, from skiascope.

FIG. 26.

Sketch of living infant's knee, from skiascope.

FIG. 27.



Sketch of orbital plate and eye, living infant's head, from skiascope.

Direct inspection by the method described is especially applicable to the body of the infant. Its tissues seem to have less power of resistance to the passage of the rays than do those of the adult, while its skeleton is so permeable as to give a much fainter shadow by this method. The writer has had occasion to observe the passage of the rays through the body of an infant four days old, to examine its limbs, and to witness the passage of the rays through the skull just behind the orbital plates. The presence of tumors, of marked bony deformities, of encysted collections of fluid, and other conditions can be diagnosticated by this method. An outline of the skeleton of a newborn

PLATE II.

Skiagraph of Infant's Body.

child is readily obtained by bandaging the child to a suitable plate and subjecting it to the action of the rays. It is unnecessary to remove the child's clothing, as the ordinary materials employed do not interfere with the passage of the rays. (Plate II.)

The location of foreign bodies in infants and young children offers an appropriate field for the use of this method of examination. It would be possible to locate a foreign body in the larynx, and even in the stomach and intestine, or any other cavity of the body without special difficulty. Fortunately, those foreign bodies which children are most apt to swallow give a distinct shadow when exposed to the action of the rays; thus, glass, coins, marbles, small metallic bodies, would be distinctly appreciated in the body of a child.

So far as known, the passage of the rays through the body of a living patient has no influence upon the cells of that body. Bacteria exposed to the action of the rays are not inhibited in their growth. Pain is not set up in this way, nor are any sensations whatever experienced. If the tube and its electrodes be brought too near the patient, a slight shock may be experienced by the jumping of the current, especially if the patient is not upon an insulated table, or if some one standing near serves to connect her body with the floor; this, however, is not a common occurrence, and beyond a very brief sensation amounts to nothing.

This method of diagnosis has been employed for too short a time to permit a definite statement as to its results, but what has been done is so remarkable that it is evident that great advantage must accompany its use. While the pregnant patient is one of the more difficult subjects for such study, still there is no insuperable difficulty in obstetric diagnosis by this method. It is a simple matter to obtain pictures of *uteri* which have been removed, containing an embryo, and also to study the skeleton of the fœtal cadaver. The living mother and child will undoubtedly prove equally susceptible to this method of investigation.

CHAPTER IV.

THE ORIGIN AND GROWTH OF THE OVUM AND THE DEVELOPMENT OF THE GERM.

While a complete account of the histogenesis of the ovary, the origin and development of the ovum, the transmission of parental characters and variations, the origin of sex, and the growth and development of the embryo must be obtained from biology and embryology, still the obstetrician should have a general knowledge of the subject sufficient to impress him with the important bearing of the

conditions of early pregnancy upon the germ, as well as to enable him to determine the period of development of the embryo and the fœtus when prematurely expelled, and also to understand the method of production of the most common of the abnormalities in fœtal life with which he may have to deal.

The development of the human fœtus results from the same laws which govern the reproduction of mammalian animals by the means of the union of living cells.

The female element, the egg or ovum, is but a highly specialized cell derived from an organ of epithelial origin. In order that we may clearly understand the development of the ovum, let us briefly trace the histogenesis of the ovary.

In the mammalian embryo two ridges of embryonic tissue (mesenchyma) arise on the dorsal side of the body-cavity, one on each side of the median line. These ridges, known as "genital ridges," are covered by a layer of peritoneal epithelium (mesothelium), which, becoming specialized coincidently with the development of the ridges, is designated as "germinal epithelium." The genital ridge, gradually enlarging as it pushes out into the body-cavity, depends from a relatively narrow base, which becomes the suspensory membrane (mesovarium).

Of the proliferating cells composing the germinal epithelium there are two kinds: one kind small and abundant, the other variety larger and less abundant (ovic cells). The development of these ovic cells is accompanied by a proliferation of smaller cells which surround them, and by means of which they are crowded back into the stroma of the genital ridge. These ingrowths, known as Pflüger's tubes or ovarian sexual cords, penetrate in all directions the peripheral zone of the vascular stroma forming the genital ridges, and thus give rise to the characteristic adult ovarian tissue. (A vascular connective tissue forming the central mass or medulla of the organ, which passes without any sharp line of demarcation into the cortical portion, where the connective tissue surrounds and separates cords of small epithelial cells, imbedded in which are larger cells, the primitive ova or ovic cells. At the periphery the stroma becomes condensed into a distinct layer, the so-called *tunica albuginea*, which forms a base for the outer investment, a modified peritoneal epithelium, the ovarian mesothelium or germinal epithelium.)

The primitive ova, primordial ova, or ovic cells are found imbedded in large numbers in cords of germinal epithelium, referred to as Pflüger's tubes, which penetrate the outer third or cortex of the ovarian mass, but never extend into the medulla. Of these primitive ova there are estimated to be some 36,000 in each mature ovary. Many of them undergo degeneration; while a small number, continuing in their growth, become completely enveloped in a layer of epithelial cells and thus separated from each other. These epithelial envelopes and their immature ova constitute the so-called primary follicles. The primary follicles sooner or later begin a course of development characterized by increase in size and number of the cells constituting the envelope. The thickening wall consists at first of a single layer of cells, but after a time several layers of cells are developed, and these

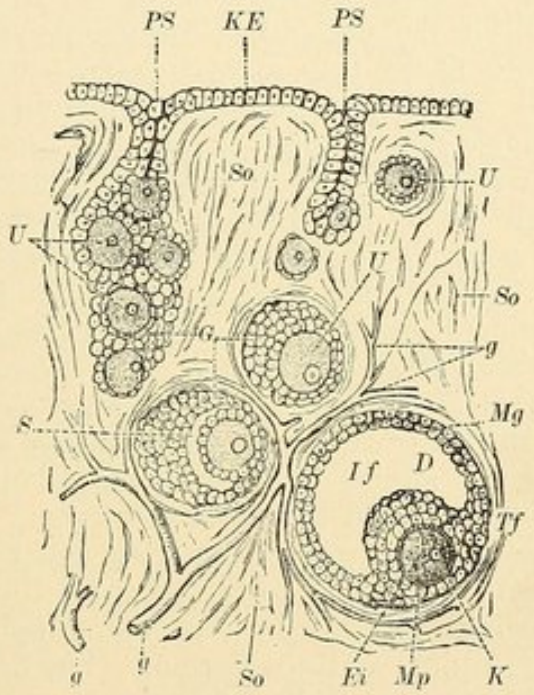
become divided by a fissure into an inner and an outer layer, the inner layer adhering to the ovum. The fissure generally enlarges and becomes filled with a fluid known as the *liquor folliculi*. With the formation of this fissure and the secretion of its serous fluid the primary follicle becomes a Graafian follicle.

The ovum covered with the inner layer of its original envelope attaches itself to that side of the Graafian follicle nearest the centre of the ovary, forming a mass of cells referred to as the *discus proligerus*.

Coincidently with these changes there has been formed a delicate membrane immediately about the ovum, known as the *zona radiata* or *zona pellucida;* while to the wall of the follicle (the *membrana granulosa*) there has been added a very delicate basement-membrane, the *membrana propria* of Waldeyer. Later on the cells of the *discus proligerus* become radiately arranged about the zone and constitute the *corona radiata*.

The Graafian follicle grows much more than the ovum and becomes cystic, owing to the accumulation of the *liquor folliculi*.

FIG. 28.



Development of Graafian follicle. (WIEDERSHEIM.)

KE. Germinal epithelium, from which Pflüger's tubes, *PS*, in ovarian stroma are developed. *So.* Ovarian stroma. *gg.* Small vessels. *UU.* Primitive ova. *S.* Space between membrana granulosa and ova. *If.* Liquor folliculi. *D.* Discus proligerus *Ei.* Ripe ovum, with germ-vesicle and germinal spot (*K*). *Mp.* Membrana pellucida. *Tf.* Muscular sheath of follicle. *Mg.* Membrana granulosa.

The cells of the vascular ovarian stroma become modified into two distinct vascular layers immediately about the Graafian follicle. These layers may be distinguished about a mature follicle as an inner *tunica propria*, carrying the smaller blood vessels, and an outer *tunica fibrosa*, carrying the coarser vessels. The vascular supply of the Graafian follicle has a most peculiar arrangement: the smaller vessels ascending from the base of the follicle become much subdivided and form a

minute network as they pass toward the summit, where they converge toward a spot on the surface of the ovary, leaving a non-vascular spot, the stigma, the point at which the Graafian follicle is destined to rupture upon reaching maturity.

As the egg becomes mature it is separated from the zona by a fissure or space (the perivitelline space); it has an axis, and at its extremity two poles; near one of these a nucleus develops, while at the opposite pole the yolk-material accumulates in a considerable mass. In a fresh specimen the egg floating freely in the zona will present the nuclear or lighter pole uppermost. The process of ripening in the egg concerns the nucleus most of all; prior to this the nucleus is large, having a well-developed membrane and reticulum; but as ripening proceeds it begins to shrink, the membrane becomes wrinkled, and the surface presents an irregular appearance. Nuclear fluid passes through the membrane into the substance of the ovum, and the small portion of reticulum remaining becomes a slender thread, called by Marshall the "nuclear skein." All that finally remains of the nucleus is this minute skein; this now moves to the surface of the egg; it gradually becomes a spindle in shape and divides into two equal parts, one of which is forced out of the egg as the first polar body; the other half subsequently divides again into a second polar body, also extruded from the egg, and into a portion which remains in the egg and is known as the "female pronucleus."

When this process is complete the ovum is said to be mature and capable of impregnation. The function and final disposition of the polar globules or polar bodies are entirely unknown. Impregnation is effected by the union of the male cell with the female pronucleus, and from this union proceeds the development of the embryo by the process of cell-division or segmentation.

The ripe ovum is discharged from the ovisac or Graafian follicle, which rises to the surface of the ovary and ruptures at the non-vascular spot referred to as the stigma; the ruptured follicle remaining at the periphery of the ovary is called the "*corpus luteum;*" this differs in appearance, depending upon the presence or absence of impregnation. The name "*corpus luteum*" is applied to the ruptured follicle because of the yellowish color assumed by this body as the follicle and its contents undergo fatty degeneration and absorption. The difference in appearance between the "*corpus luteum*" of menstruation which remains after the discharge of an ovum which is not impregnated and the "*corpus luteum*" which follows the discharge of an ovum subsequently impregnated is given as follows by Minot and Dalton:

"The corpus luteum of menstruation begins with a blood-clot. The more recent the date of the menstrual flow the fresher is the clot in the cavity of a ruptured Graafian follicle and the less change has taken place in its surrounding wall. A few days later the wall begins to be enlarged and thickened, and this enlargement within a confined space causes it to become folded upon itself in short, zigzag reduplications, mainly at the deeper part of the follicle. As the process goes on the entire wall participates in the hypertrophy. Its convolutions are

extended and multiplied, often in a very complicated manner. They project into the cavity of the follicle, encroach on the central clot, and become pressed against each other, forming by their coalescence a thickened, granular-looking envelope. Previously to the rupture of the Graafian follicle its wall is a uniformly smooth, vascular membrane, not more than one-fourth of a millimetre in thickness. After the rupture its thickness increases to one-half a millimetre, but as the foldings above described grow in number and in depth, and crowd against each other laterally, the apparent thickness of the envelope thus formed becomes much greater, and may reach three or even four millimetres, especially at the deepest part of the follicle. In this way there is produced, during the intermenstrual period, a corpus luteum, occupying the substance of the ovary immediately beneath the superficial cicatrix which marks the site of the ruptured follicle. At this time the central clot is red and gelatinous, while the convoluted wall is of a light rosy hue mixed with more or less of a yellowish tint. Subsequently the whole structure diminishes in size and the convoluted wall assumes a more decided yellow."

Leopold distinguishes between the *typical* and *atypical* corpora, the former being those that start at the menstrual epoch and have a blood-clot, a result probably of the ovarian hyperæmia; the latter beginning intermenstrually and having little or no blood. He says: "The typical corpus luteum appears on the first day as a freshly ruptured follicle which has filled itself with blood; on the third day as an immense blood-cavity; about the eighth day a thin cortex and a clearer nucleus are marked in the clot. From the twelfth day on the cortex thickens and becomes folded; by the sixteenth day it becomes pale red or yellowish. Toward the twentieth day the nucleus shrinks markedly; the cortical band becomes more and more yellow and shoots in toward the centre in rays and narrow folds, so as to leave, by the twenty-fourth day to the thirty-fifth day, only a small, pale nucleus enclosed in a much-convoluted bright yellow shell."

Dalton further observes on this subject: "The corpus luteum of pregnancy begins in a similar manner to that of menstruation, but its growth continues. At the end of the first month its wall is convoluted, much thickened, and of a brilliant yellow color; the central clot is nearly or quite decolorized, and constitutes a white or whitish, firm, central mass, which in nearly one case out of three has a central cavity with well-defined, smooth walls. Sometimes a few bloodvessels penetrate through the lutein layer. The external convoluted wall continues to grow by encroaching upon the clot or white nucleus (*corpus albicans*), and at the same time the brilliancy of the yellow color diminishes. At term the white nucleus takes up about one-third of the diameter of the corpus and is still distinctly connected with the stigma, so that the lutein wall is interrupted at one point; the corpus, as a whole, is somewhat smaller than at from two to six months. After delivery resorption goes on rapidly.

"The brilliant yellow color is especially characteristic of man; in

sheep the pigment is pale brown; in the cow, dark orange; in the mouse, brick-red; in the rabbit and pig, flesh-colored."

Lutein is a crystalline body and one of a series of animal pigments known as lipochromes, which are found abundantly in the blood and viscera of animals and in the yolks of eggs. They are characterized in spectroscopic analysis by presenting absorption-bands toward the violet end of the spectrum. Lutein occurs in minute, rhombic prisms or plates, which present different colors when viewed in the direction of different axes. These crystals are soluble in alcohol, ether, chloroform, and benzol, insoluble in water and more or less rapidly bleached by the action of light.

In considering the formation and impregnation of the ovum the very interesting question arises, In what way can the remarkable transmission of parental peculiarities be accounted for by the development of such apparently simple elements as animal cells? It is not from lack of speculation that we are unable to answer the question. The acceptance of the axiom that function presupposes structure led to the conclusion that the phenomenon of development must be referred to organization of some sort in the ovum. The all-sufficiency of the cell-doctrine began to be doubted as far back as 1886, when Naegeli[1] concluded the organism to be in a sense "vorgebildet" (foreshadowed) in the germ-cell. Brücke,[2] in 1861, recognized that the phenomena of life are not referable to an unorganized substance. He disputed *a priori* the possibility of all the complicated functions of a cell being carried on by a "simple, slimy, rather viscid fluid," as protoplasm was held to be by prominent investigators in the fifties and sixties.

According to Brücke: "We must ascribe to living cells, in addition to the molecular structure of the organic compounds which they contain, still another and otherwise complicated structure, and it is this we designate organization."

Brücke having thus taught the necessity of assuming structure as the basis of vital phenomena, we find Naegeli[3] soon after developing a theory of the molecular structure of protoplasm, based on the most painstaking observations.

The cell of the cell-doctrine, as based upon the epoch-making studies of Schleiden,[4] and Schwann,[5] Virchow,[6] and Gegenbaur,[7] has come to be no longer available as the ultimate unit of life, and modern biologists are "to account," as Whitman[8] puts it, "for heredity by the

[1] Naegeli, Carl: Beiträge zur wissenschaftliche Botanik, 1860, Heft 2.

[2] Brücke, Ernst: Elementarorganismen. Sitzungsb. d. K. Akad. Wien, Bd. xliv. II. Abth. (Jahrg. 1862), pp. 381–406.

[3] Naegeli, Carl: Botanische Untersuchungen, 1862, Heft 1, p. 187; Heft 2, p. 147. Also Beiträge zur wissenschaftliche Botanik, 1863, Heft 3. (*Cf.* Kollmann: Biol. Centralbl., iv. pp. 488–517. Naegeli here establishes the theory of germinal continuity, according to which every living cell consists of two substances, one of which alone carries on the function of heredity transmission; this he named "idioplasm;" it corresponds to the "germ-plasm" of Weismann. The second substance is the nutritive plasm, corresponding to the "*histogenes plasma*" of Weismann.)

[4] Schleiden, Matthias Jakob: Beiträge zur Pnytogenesis. Müller's Archiv, 1838, Heft 2, pp. 137–176.

[5] Schwann, Theodor: Mikroskopische Untersuchungen über die Uebereinstimmung in der Structur und dem Wachsthum der Thiere und Pflanzen, S. xviii. p. 270, 4 tab. Berlin: Reimer, 1839.

[6] Virchow, Rudolph: "Cellular Pathologie." Virchow's Archiv, Bd. vii. Heft 1.

[7] Gegenbaur, Carl: Ueber d. Bau u. d. Entwicklung d. Wirbelthiereier mit partieller Dottertheilung. Müller's Archiv, 1861.

[8] Whitmann, C. O.: "On the Inadequacy of the Cell-theory of Development." Biological Lectures, p. 112. Boston: Ginn & Co., 1894.

postulation of primary elements, in comparison with which the cells appear as complex organisms."

As a basis for this organization of the cell, Brücke[1] contended for the existence of "smallest parts."

Such fundamental vital units Naegeli termed "micellæ,"[2] conceiving them to be minute polyhedral crystals surrounded by fluid. In Darwin's[3] theory of pangenesis we find similar hypothetical, germinal particles, called "gemmules," each capable of reproducing its kind. These gemmules were held to be continually thrown off from the different cells of the body, carried about in the circulation, and deposited in the cells throughout the organism; becoming aggregated especially in the generative cells. Each gemmule being supposed to be able to reproduce the variety of cell which gave it origin, enabled the cells in which the gemmules found final lodgement to reproduce lost parts; or, in the case of the germ-cells, entire organisms, possessing all the peculiarities of the immediate parent or even of a distant ancestor, since the gemmules were supposed to be capable of lying for a long time dormant. Structural peculiarities were held to be reproduced in the exact order of their development in the parent organism through the gemmules becoming active in the same order as did the cells from which they were derived. The theory of pangenesis was immediately taken up by biologists, and the gemmules of Darwin replaced by other conceptions or made to do duty under other names; thus, by Béchamp and Estor[4] they were termed "microzymas;" while those of Elsberg[5] and Haeckel[6] were disguised under the alias of "plastidules."

According to Spencer,[7] all the cells of a living organism were supposed to consist of "physiological units," intermediate between chemical units and morphological units or cells. They were held to possess polarity or the tendency to aggregate in the form of certain species, just as the molecules of a salt tend to crystallize in a specific form; the organisms being thus enabled to replace lost parts or the germ-cells to reproduce entire organisms.

A little later Theodore Englemann[8] put forward certain hypothetical "combinations of molecules," under the name of "inotagmen," as the source of all protoplasmic motion.

Brooks,[9] in his work on *Heredity*, adopted the gemmule-theory, attributing to the male germ-cell a particularly strong power of attraction for the gemmules; in short, just such a chemotactic influence as is exerted by the ovum upon the spermatozoid.[10] A few years later

[1] Brücke, Ernst: Die Sogenannten Molecularen. Sitzungsb. d. K. Akad. Wien, 1862.
[2] Loc. cit., 3.
[3] Darwin, Charles: The Variation of Animals and Plants under Domestication. Authorized edition. New York, 1868, vol. ii. pp. 488-489.
[4] Béchamp et Estor: Du role des microzymas pendent le developpement embryonnaire. Compt. rend. Acad. Sci. Paris, 1872, T. lxxv. p. 962.
[5] Elsberg, Louis: "Regeneration, or the Preservation of Organic Molecules; A Contribution to the Doctrine of Evolution." Proc. Amer. Asso. Adv. Sci., 1874, pp. 87-103. Also, "On the Plastidule Hypothesis." Ibid., xxv. p. 178.
[6] Haeckel, Ernst: Die Peregenesis der Plastidule, oder die Wellenzeugung der Lebenstheilchen. Ein Versuch zur Mechanischen Erklarung der Elementaren Entwicklungs-Vorgange. Berlin, 1876.
[7] Spencer, Herbert: The Principles of Biology, 1872.
[8] Englemann, Theodore: "Physiologie der Protoplasma-und Flimmerbewegung." Handbuch der Physiologie-herausgeg. v. Hermann, 1879, Bd. i. p. 341.
[9] Brooks, W. K.: The Law of Heredity; A Study of the Cause of Variation and the Origin of Living Organisms. Baltimore, 1879.
[10] *Cf.* Pfeffer: Untersuchungen, Bot. Inst. Tübingen, 1884, Bd. i. Heft 3.

Galton,[1] in discussing the gemmules, accepts the theory of their existence, but denies that they are carried about by the circulation.

Altmann[2] presents us with the theory of vital units under the name of "bioblasts." The year following we find in Foster's work on *Physiology:*[3] "Just as in the division of the chemical mass we come to the chemical molecule, the further division of which changes the properties of the substance, so in the continual division of the amœba we should come to a stage in which further division interfered with the physiological action; we should come to a physiological unit corresponding to but greatly more complex than the chemical unit."

Under the name of "pangenes" de Vries[4] postulates the existence of certain ultimate vital particles which go to form germ-cells. These he holds to be the primary bearers of the qualities of the species and to be of as many varieties as there are qualities in the species. To these correspond the "plasomes" of Wiesner[5] and the "biophores" or hypothetic "bearers of vitality" which lie at the basis of the organization of the "germ-plasma" of Weismann[6] as well as to the "idioblasts" of Oscar Hertwig.[7]

Notwithstanding the confusion resulting from a multiplication of names for these hypothetical vital units, Whitman[8] proposes to name them "idiosomes." What these idiosomes are, how they determine organization, form, and differentiation, is the problem of problems on which we must wait for more light. All growth, assimilation, reproduction, and regeneration may be supposed to have their seat in these living elements. They make up all living matter, are the bearers of heredity, and the real builders of the organism. It is somewhat of a relief to note, in the same volume, the remarks of the late Professor Ryder,[9] in which he refers to the hypotheses which we have briefly sketched as follows: "I will predict what I believe will yet be possible, viz., the discovery of the true causes in detail of the forms of all organized existences. In order, however, to accomplish this end, the following will have first to happen, namely, an abandonment of all hitherto accepted hypotheses of inheritance, a new conception of the nature of life, new views of the nature of the process of natural selection, and, above all, the abandonment of all such conceptions as gemmules, biophores, pangenes, plasomes, etc., and the admission that the phenomena of life are ultimately physical in their nature and are to be treated in detail as physical problems."

It is evident that in seeking the answer to the question, How are parental peculiarities transmitted to the offspring? the student is called

[1] Galton, Francis: Natural Inheritance. London, 1889.
[2] Altmann, R.: "Die Genese der Zellen." Beiträge zur Physiologie. C. Ludwig gewidmet. Leipzig, 1887.
[3] Foster, M.: A Text-book of Physiology. Fifth edition, 1888, pp. 5–6.
[4] Vries, de Hugo: Intracellulare Pangenesis, June, 1889
[5] Wiesner, J.: Die Elementarstructur und das Wachsthum der lebenden Substanz. Wien, 1892, p. 75.
[6] Weismann, A.: Die Continuität des Keimplasmas, als Grundlage einer Theorie der Vererbung. Jena, 1885. Also, Die Bedeutung der Sexuellen Fortpflanzung. Jena, 1886. (*Cf* Kollmann, in Biol. Centralbl., v. p. 673.) Also, Studies in the Theories of Descent. Meldolas Transl. London, 1880–82. Also, Essays upon Heredity and Kindred Biological Problems, translated by E. B. Poulton, Oxford, 1889.
[7] Hertwig, Oscar; Die Zelle und Die Gewebe. Grundzüge der allgemein Anatomie und Physiologie. Jena, 1892, p. 272.
[8] Loc. cit., 8, p. 123.
[9] Ryder, John A.: "Dynamics in Evolution." Biological Lectures. Boston: Ginn & Co., 1894.

upon to pass in review a most interesting series of observations and theories. Harvey,[1] who was far ahead of his age, was the first to arrive at the conclusion that every animal is produced from an ovum (*ovum esse primordium commune omnibus animalibus*) by an actual new formation of organs, and not by a method of unfolding, according to the theory of preformation or incasement, as held by the ovists and spermists or animalculists of his time and during the early part of the eighteenth century. In 1677 Leeuwenhoeck[2] discovered the spermatozoa, but it was not until 1859 that Wolff[3] re-established Harvey's theory of epigenesis by his researches on the embryology of the chick. Pander,[4] in 1817, took up Wolff 's work and carried it to greater perfection. Finally von Baer[5] discovered the mammalian ovum, and soon after Wagner[6] and Siebold[7] elucidated the real nature of the spermatozoa. Following close upon these discoveries came the development of the cell-theory, through the observation of Johannes Müller,[8] who called attention to the fact that the cells of the chorda dorsalis possess proper cell-walls, which he compared to the cell-walls of plant-tissues. These observations awakened an interest which led to the developments of Schleiden[9] and Schwann[10] and their immediate successors, culminating in Virchow's aphorism, *omnis cellula e cellula*,[11] and Gegenbaur's demonstration that the vertebrate ovum is a single cell.[12] Up to this period the cell-doctrine was all-sufficient, and the cell reigned omnipotent as the ultimate vital element. Gradually, as the result of the teachings of such men as Brücke,[13] Sachs,[14] Nussbaum,[15] and Gruber,[16] the number of apostates to the doctrine of cell-hegemony became more and more numerous, until it has become the rule, as we have seen, for students of heredity to stake their faith on the existence and continuity of hypothetical, physiological units ; taking their choice from the great variety offered in the various theories referred to above. At present many writers of materialistic tendencies, not content with the hypothetical vital units, practically acquiesce in the belief expressed by Loeb[17]

[1] Harvey, William: Exercitationes in Generatione Animalium. London, 1651, 4to. (See translation by R. Willis, Sydenham Society, 1847.)

[2] Leeuwenhoeck, Antonius van: Works of, translated by Samuel Hoole. London, 1798–1801.

[3] Wolff, Caspar Friedrich: Theoria generationis. Halae, 1759. De formatione intestinorum. Nov Comment. Akad. Petrop., 1766. Ueber a. Bildung d. Darmcanals in bebürteten Hünchen. Halle, 1812.

[4] Pander, Christian Heinrich: Beiträge zur Entwick. d. Hünchens im Ele. Würzburg, 1817.

[5] Baer, Carl Ernst von: Entwick lungsgeschichte d. Thiere. Konigsberg, 1828–1837.

[6] Wagner, Rudolph: "Ueber die Geschlechtwerkzeuge der Blutegel und über merkwürdige Eigenschaften ihrer Samenthierchen." Müller's Archiv, 1835. pp. 220–23. Also, Fragmente zur Physiologie der Zeugung., p. 29, in Trans. Math. Phys. Cl. K. Baier, Akad. Sci., Munchen, 1837. *Cf.* Wagner and Leuckhart, article "Semen," in Todd and Bowman's Cyclopœdia of Anatomy and Physiology, 1847–1849, part i. vol. iv. pp. 472–508.

[7] Siebold, C. Th. E. von: "Ueber die Spermatozoen der Crustaceen, Insecten, Gasteropoden und Einiger anderer wirbellosen Thiere." Müller's Archiv, 1836, pp. 13–53. Also, "Fernere Beobachtungen über die Spermatozoen der wirbellosen Thiere." Ibid., 1837, pp. 380–427 Also, "Ueber die Spermatozoen der Locustinen." Acta Acad. Leop. Carol. Nat. Cur., vol. xxi. part i. p. 1.

[8] Müller, Johannes: Vergleichende Anatomie der Myxinoiden u. der Cyklostomen mit durchbohrtem Gaumen. I. Osteologie und Myologie. Abhandlungen der koniglichen Akademie der Wissenschaft zu Berlin, 1834.

[9] Loc. cit., 4. [10] Loc. cit., 5. [11] Loc. cit., 6.

[12] Loc. cit., 7. [13] Loc. cit., ii. p. 373.

[14] Sachs, Julius: Handbuch der Experimental-physiologie der Pflanzen. Leipzig, 1866. Also, *cf.* Vorlesung über Pflanzen-physiologie. Leipzig, 1882.

[15] Nussbaum. M.: "Kunstliche Theilung der Infusorien." Archiv für mikroskopische Anatomie, 1886, xxvi. pp 485–538 Also, Science, vi. p. 4.

[16] Gruber: Mikroskopische Vivisection. Berichte der Naturforchenden Gesellschaft zu Freiburg, 1893, Bd. vii. Heft 1.

[17] Loeb, Jacques: "On Some Facts and Principles of Physiological Morphology." Biological Lectures, p. 53. Boston: Ginn & Co., 1894.

that "all life-phenomena are determined by chemical processes;" or with Bütschli[1] and Ryder,[2] who couple with chemical action such physical conditions as gravity, viscosity, surface-tensions, adhesions, and friction; others look beyond all purely physical and chemical phenomena to the action of some anagenetic or up-building force, some growth, energy, or bathmism, as Cope[3] terms it. And thus the circle of hypothesis is complete, and we are left practically no nearer the secret of vital function and the mode of its transmission than were the apostles of *anima mundi*. As we have seen, the germ-cell long ago lost caste in its *rôle* as a vital unit and came to be "conceived as a kind of microcosm, not similar to but a perfect symbol of the macrocosm to which it gives rise."[4] Finally this notion of a microcosm of self-determining, cell-forming units, based upon Darwin's doctrine of pangenesis, remodelled by de Vries and pushed to its uttermost logical limit by Weismann, appears to be gradually giving way to the idea that while every cell consists of two chemically distinct elements, the cytoplasm and the nucleus or chromosome, it is to the latter alone that we must look as the organ of heredity-transmission, a proposition first made by O. Hertwig.[5] This theory has found able supporters in Kolliker,[6] Minot,[7] and others. From the latest point of view we find that the nucleus, in its turn, has been discarded and the theory reduced to a purely chemical one, as is indicated in Minot's[8] conclusion that "we may go one step further: since the chromatin is the characteristic of the nucleus, and since spermatozoa in some cases consist almost exclusively of chromatin, it is probable that *chromatin is the essential factor in the function of heredity;*" and, furthermore, that "*the child is like the parents because its organization is regulated by not merely similar, but by some of the same chromatin as that of the parents.*" Minot admits, however, that the validity of these hypotheses is as yet undecided.

In discussing the origin and transmission of variations, Ryder[9] terms Weismann, Lankester, and others who doubt the transmission of acquired characters "deluded skeptics," notwithstanding which a dispassionate consideration of the data at hand leads to the conclusion that there is comparatively little evidence of the direct production of transmissible changes by means of external influences. In other words, the preponderating evidence seems at present to be toward the view that all environmental variations are restricted to the individual organism; that they are not transmissible. It has been proved by Loeb,[10] Dreisch,[11] and others that very slight changes in the chemical, thermal, or static environment of the ovum may produce marked structural and

[1] Bütschli, O.: Investigations on Microscopic Foams and on Protoplasm. London: Adam and Charles Black, 1894.
[2] Ryder, John A.: "Dynamics in Evolution." Biological Lectures. Boston: Ginn & Co., 1894.
[3] Cope, Edw. W.: The Origin of Structural Variations. 1894.
[4] *Cf.* Wilson, Edmund B.: "The Mosaic Theory of Development." Biological Lectures, p. 5. Boston: Ginn & Co., 1894.
[5] Loc. cit., 3.
[6] Kölliker, A.: Die Bedeutung der Zellenkerne für die Vorgänge der Vererbung. Zeitschr. für Wiss. Zoöl., 1885, Bd. xlii. pp. 1–46.
[7] Minot, C. S.: "Heredity." Science, viii. pp. 125–130.
[8] Minot, C. S.: Human Embryology, p. 90. New York: Wm. Wood & Co., 1892.
[9] Ryder, John A.: "The Origin of Sex through Cumulative Integration and the Relation of Sexuality to the Genesis of Species." Proc. Amer. Philos. Soc., vol. xxviii. pp. 109–159.
[10] Loeb, Jacques: Loc. cit., 37.
[11] Dreisch: "Entwichlungs mechanische Studien." Zeitschr. für wissenschaftliche Zoologie, Bd. liii. and lv.

functional changes in the embryo by disturbing or impeding the karyokinetic processes. Ryder[1] claims that such a disturbance of a single karyokinesis "must disturb all subsequent ones." This claim is not supported by any evidence that disturbances or mutilations of the ovum, embryo, or adult are capable of perpetuation in the race. While there is no doubt that lack of food, impoverishment of the blood, alcoholism, or alkaloidal saturation of the parental organism may produce striking disturbances and defects in a given embryo, there is no direct proof that these particular defects are transmissible. Cope,[2] Ryder,[3] de Varigny,[4] Thompson,[5] and others have brought many arguments and certain facts to bear in favor of the theory of the transmission of acquired characters. The views held by Cope may be summed up in his own words,[6] that "the germ-plasm is acted upon by impressions from without in much the same way as impressions are fixed upon brain-matter, and which, recalled under consciousness, give rise to the phenomena of memory. In the same way, substantially, impressions are made upon the germ-plasm ineffaceably, and these are reproduced through the embryonic process at birth. The effects of these external influences are twofold—first, upon the parent; and, secondly, upon the germ-plasm." Cope calls this *diplogenesis*. Hyatt[7] calls it *mnemogenesis*. Facts are often cited as evidence of the transmission of acquired characters which seem at first sight conclusive, but which may be open to other interpretation; of such a character are the following remarks by Cope in the paper referred to:

"That acquired characters may be inherited is demonstrated by many facts. One class of these facts is derived from the study of the embryo of mammalia. The characters of the articulations of the skeleton I have shown to be the direct result of mechanical impacts and strains, persistently recurring during the lifetime of the individuals, throughout the ages of geological time. Now these characteristics are found in the fœtus before birth, and are therefore clearly not due to causes acting upon the adult during its lifetime. They have been acquired during earlier periods, and have now become congenital. This has been especially observed by Wortman. An equally remarkable case has been recorded by von Brunn. The ancestors of the genus Mus are known to have had in past geological ages tubercular molars whose cusps are covered with enamel. In the genus at present the tubercles of the molars are not covered at the apices with enamel, but display areas of exposed dentine which are surrounded with enamel, whose hard border is an important element in mastication. Von Brunn shows that in the dental papilla the enamel-layer is complete over the cusps of the molar, but that prior to the eruption it undergoes atrophy at these points. The cells degenerate and no enamel-layer is developed on the summits of the cusps, and they are so erupted. Thus the

[1] Loc. cit., p. 140. [2] Loc. cit. [3] Loc. cit.
[4] De Varigny, Henry: Experimental Evolution. London: Macmillan, 1892.
[5] Thompson, J. Arthur: "Synthetic Summary of the Influence of the Environment upon the Organism." Proc. Roy. Phys. Soc., Edinburgh, 1887. Also "History and Theory of Heredity." Ibid., 1889.
[6] Loc. cit., p. 298.
[7] Hyatt, Alpheus: "Bioplastology and the Related Branches of Biologic Research." Proc. Boston Soc. Nat. Hist., 1893, p. 73.

apparently worn condition of the cusps of the molars in the rat is not due to wear during the life of existing individuals, but is born with them, being inherited from previous generations. But it is certain that this condition was originally produced by wear of the used crowns of the molars of species of past geological ages, in which enamel-layer was complete at birth."

Ryder supposes that "the parent transmits certain polarities, and those of the most important character, directly to the germ-plasm from which the embryos are developed." He holds that the axis of the parent and the polarity of her body, as expressed in its fore and aft extension, exert such an influence as to transmit the polar tendency to every ovum in her body. By this proposition Ryder carries the morphological history of the ovum further back than does His[1] in the idea of the preformation of germ-regions, according to which the various regions of the differentiated embryo are derived from corresponding regions in the unsegmented ovum. The experiments of Loeb and Dreisch, already referred to, prove that any part of the protoplasm of the ovum, prior to the formation of the blastula, may give rise to a fully developed embryo, and that the number of embryos which come from one ovum is not determined by the preformation of germ-regions in the cytoplasm or nucleus, but by the geometrical shape of the ovum and the molecular condition of the protoplasm, *i. e.*, the distribution of chemically different materials. All of which would seem to indicate that the polarity of each germ is determined by the source of its nutrition, its surface-tensions, by gravity, resistance to growth, etc., rather than the transmission of bodily habits acquired by its parents.

The experiments of Loeb in the production of heteromorphism among lower animals prove that polarity (or polarization, as Loeb calls it) scarcely exists in certain forms (*antennularia, margelis, pennaria*); that in other forms (*e. g., tubularia mesembryanthemum*) it is more apparent; while in many animals the most perfect illustration of the phenomenon is to be found. Polarization cannot, therefore, be held to have been acquired by the individual exhibiting it or by any given ancestor, but rather to be due to physical conditions governing the development of each embryo—conditions which vary for different species, but remain fairly constant for each, and which were established for a given species, not as the result of character transmitted by ancestors, but in spite of previous ancestral habits. It is not a question of acquired habit, but of continuance of certain physical conditions, under which the fertilized ovum may develop into an organism resembling that from which its original molecules were derived.

Ryder's proposition, moreover, appears inconsistent with the idea to which he gives adherence, namely, that "the germinal cells are never belabored with any physiological function in the parent body," being "the only ones which lead to the charmed existence of perpetual youth."

That rejuvenescence through reproduction depends upon this peculiarity (perpetual youth) of germ-cells suggests that the reason why a

[1] His, W.: Untersuchungen über die erste Anlage des Wirbelthierleibes. 4to. Leipzig, 1868. Also Unsere, Körperform. 8vo. p. 224. Leipzig, 1874.

given germ does not develop in the mode of its primitive ancestor is because the conditions which surround it are different from those under which its primitive ancestors developed. What the embryo acquires from its immediate parent is not a "habit of polarity" or anything of the kind, but a set of conditions so like those under which the parents developed that the results of the two developments are practically alike.

De Varigny[1] and Thompson[2] refer to a large number of cases of variation due to environment and domestication. The former instances certain psychological "attitudes"—for example, the fear of natural enemies by very young animals—as cases of acquired characters.

It must be borne in mind that striking structural variations, and undoubtedly physiological variations as well, occasionally occur in such a manner as to prevent them being referred to a constitutional or germinal origin on the one hand, or to the environment experienced by any one individual germ on the other.

Dall[3] calls attention to the frequent occurrence of "sudden and considerable variations which seem to take place under the cumulative influence of a number of small causes which remain for a long time in operation, but become efficient when at last one more slight influence is added."

This sudden variation seems not to have been sufficiently considered by Galton and others who have made a study of the evolution of men of genius. Galton[4] says: "When nature and nurture compete for supremacy upon equal terms the former proves the stronger." This may be true where the "pre-efficients," which he collectively calls "nurture," have been applied to but one or two individuals; but the history of social evolution indicates that the effects of nature are cumulative in the race and result every now and then in men who are undoubted variations, geniuses, or freaks; and just as the "bulldog" or "Niata" and the "big-horn" or "Franqueiros" breeds of cattle originated as sports of sudden variations, so human variations apparently may take place *per saltum*.

The tendency of the germ-cell to reproduce along primitive lines would appear to be so strong that for a long time it resists the gradually changing conditions in the species; but finally these conditions prove too much in some one case, and an offspring appears that varies greatly from its species, and which in its own organization combines conditions similar to those which have been applied in varying degrees to previous embryos of its race, but which they have resisted sufficiently to escape being considered variations. We may end this consideration with the general conclusion that it is not yet proved that variations are predetermined in the ovum, but so far as experience goes they are the result of chemical and metabolical conditions within and without the embryo.

The question of sex comes under the head of variations, since the female state must be regarded as a variation from a more primitive or male state. This view is supported by evidence to which we have

[1] Loc. cit., p. 225. [2] Loc. cit.
[3] Dall, W. H.: On a Provisional Hypothesis of Saltatory Evolution.
[4] Galton, Francis: Englishmen of Science, p. 9. New York: Appleton & Co., 1875.

already referred, to the effect that sex is determined late in the history of embryonic development and depends to a great degree upon the trophic conditions of the mother.

Variations are not to be attributed to inheritance, but to disturbances of the developmental process; and the degree of the variation from the normal type may be so slight as to escape observation, or so great as to constitute a monster with every gradation of variation between the two extremes.

The later the stage of development disturbed the slighter the variation; whereas, karyokinetical disturbances of the earlier stages of development may give rise to monsters or twins.

The experiments of Loeb and Dreisch, referred to above, demonstrate the fact that several perfect embryos may be derived from the same ovum. Where multiple offspring arise from the same ovum they constitute "true" twins, and are of the same sex.

It is beside our purpose to discuss at length the factors entering into the determination of sex. Those desiring to get at the basis upon which our brief generalizations are founded are referred to the works of Dusing,[1] Heyer,[2] Semper,[3] Geddes,[4] Thompson,[5] Weismann,[6] Wilckens,[7] Yung,[8] and Ryder.[9] The factors generally considered are: (*a*) Time of fertilization; (*b*) conditions of nutrition, age, etc., of the parents; (*c*) condition of the reproductive elements; (*d*) environment of the embryo.

(*a*) The longer the time between the liberation and fertilization of the ovum the greater the tendency to the development of a male.

(*b*) The age of the parents seems to be of secondary importance, statistics failing to confirm Hofacker's[10] and Sadler's[11] law that "when the male parent is the older the offspring are preponderatingly male, while if the parents be of the same age, *a fortiori*, if the male parent be the younger, female offspring appear in increasing majority.

(*c*) The condition of the reproductive elements, depending upon the constitution and habits of the parents, has undoubtedly much to do toward determining sex. The tendency is toward the sex of the better-nourished parent.

In seasons of adversity—famine, war, epidemics, poor harvests, or

[1] Düsing, C.: Die Regulierung des Geschlechtsverhältnisses bei der Vermehrung der Menschen, Thiere, und Pflanzen. Jena, 1884; or, Jen. Zeitsch. f. Naturw., xvii. 1883. Also, Die experimentelle Prüfung der Theorie von der Regulierung des Geschlechtsverhältnisses. Jen. Zeitschr. f. Naturwiss., xiv., Supplement, 1885.

[2] Heyer, F.: Untersuchungen über das Verhältniss des Geschlechtes bei einhäusigen und zweihäusigen Pflanzen, unter Berücksichtigung des Geschlechtsverhältnisses bei den Thieren und den Menschen, Ber. landwirthschaftl. Inst. Halle, 1884, v. pp. 1–152.

[3] Semper, Carl: The Natural Conditions of Existence as they Affect Animal Life. Internat. Science Series. London, 1881.

[4] Geddes, Patrick: Articles "Reproduction," "Sex," "Variation and Selection." Encyclopædia Britannica. Also, on the "Theory of Growth, Reproduction, Sex, and Heredity." Proc. Royal Soc., Edinburgh, 1885–86. Also, Geddes and Thompson: The Evolution of Sex, 1891. New York: Humboldt Publishing Co.

[5] Loc. cit., 49.

[6] Weismann, Aug.: Loc. cit., 22. Also, The Germ Plasmia Theory of Heredity. Translated by W. N. Parker; 24 illus. New York: Scribner, 1893.

[7] Wilckens, M.: Untersuchungen über das Geschlechtsverhältniss und die Ursachen der Geschlechtsbildung in Haustieren. Biol. Centralbl., vi. (1886), pp. 503–10; Landworth, J. B., xv., 607–10.

[8] Yung, E.: Contributions à l'Histoire de l'Influence des milieux Physiques sur les Etres Vivants. Archiv Zoöl. Exper., vii. (1878) pp. 251–82; (1883) pp. 31–55. Arch. Sci. Phys. Nat., xiv. (1885) pp. 502–22, etc.

[9] Ryder, John A.: Origin and Meaning of Sex. American Naturalist, June, 1889. Also, loc. cit., 45.

[10] Hofacker: Ueber die Eigenschaften, welche sich bei Menschen und Thieren auf die Nachkommen vererben. Tubingen, 1828.

[11] Sadler: Law of Population. London, 1830.

high prices—when the females are more poorly nourished than usual, male births predominate. Females with small placentæ are said to bear more boys.

The generalization may, therefore, be made that all conditions which tend to the vigorous and well-nourished condition of the ovum and of the mother after impregnation tend to the production of female offspring. On the other hand, all conditions which tend to a loss of vitality in the ovum, such as delayed fertilization or trophic impairment of the mother before and after impregnation, tend to determine the sex of the offspring as male.

Entrophic conditions—*i. e.*, perfect nutrition and assimilation with anabolic or growth-tendencies in the mother—determine predominant femaleness in the progeny.

Katabolic tendencies, depending upon deficient nutrition (trophesy, physiological disintegration), determine predominant maleness in the progeny.

The period of development at which sex is determined is very early in the human embryo, there being really no period of prolonged sexual neutrality or embryonic hermaphroditism, notwithstanding the apparent delay in the determination or development of the genital organs corresponding to the sex.

CHAPTER V.

THE GROWTH AND DEVELOPMENT OF THE EMBRYO.

RETURNING to the consideration of the growth of the embryo, we find its further development to be in accord with the laws of evolution and the phenomena observed by biologists in studying the same processes in other than the human species.

As discharged from the ovary, the ovum is surrounded by the *corona radiata*, which disappears upon impregnation. Segmentation is thought to begin with the passage of the ovum through the oviduct. The ovum separates in various planes, which have been followed up to twelve segments. Succeeding cleavages increase the segments or cells many-fold. The cells of the ovum, sometimes termed during segmentation "segmentation-spheres," have no membrane; the nucleus is large, clear, and vesicular, while the yolk-granules are small, highly refractile, and nearly spherical.

Passing through the oviduct into the uterus, the ovum dilates into the blastodermic vesicle, the cells of the outer layer multiply and flatten, thinning and expanding the *zona pellucida*.

The internal aggregation of cells is attached to some point on the circumference of the vesicle. This leaves a cavity between two layers called the "segmentation-cavity," or cavity of the blastoderm. As the blastodermic vesicle continues to expand it produces, in some animals, a corresponding increase in the size of the uterus. The vesicle contains fluid secreted by the layers in the wall of the vesicle, which in

turn derive the fluid from an abundant secretion from the glands in the uterus. This uterine secretion is undoubtedly nutritious in character. The inner comparatively thick mass of cells becomes gradually differentiated into two layers, superior and inferior, external and internal, the "ectoderm" and "endoderm." Minot was the first to establish the general principle that in all animals the ovum undergoes a total segmentation, during which the cells of the ectoderm divide faster and become smaller than the cells of the endoderm. These layers grow by

FIG. 29.

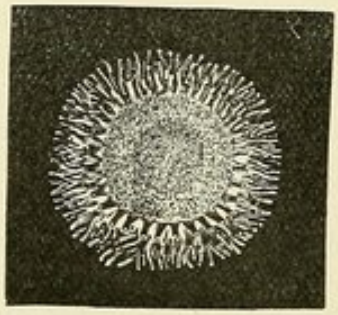


FIG. 30.

Impregnated ovum, thirteen days old. (SCHULTZE.)

what is styled "concrescence," gradually forming two layers or plates which unite in the axial line about the canal of the primitive trace or notochord. The cells immediately surrounding the primitive trace are often lighter in color and clearer than the other cells of the ovum. As segmentation becomes complete, and the two layers of cells described begin to form, the ovum is sometimes styled the "morula," because of its resemblance to a mulberry. The primitive trace or axis is well studied by transverse sections, which show layers of cells from which develop the various portions of the body. These layers may be broadly grouped in three, formerly known as epiblast, hypoblast, and mesoblast, and termed by later writers ectoderm, endoderm, and mesoderm.

In classifying the various organs of the body which develop from these layers the basis of classification must be the essential element in the organ in question. Upon this basis the following classification, tabulated by Minot, may be taken as a comprehensive and rational one:

Ectodermal.	*Mesodermal.*	*Endodermal.*
Skin (epidermis).	1. Mesothelium.	Epithelium (digestive tract).
Epidermal structures:	Peritoneum.	Thyroid.
Hairs.	Pleuræ.	Tonsils.
Glands:	Urogenital.	Trachea and lungs.
Sebaceous.	Wolffian body.	Œsophagus.
Sudoriic.	Kidney.	Stomach.
Salivary	Testes.	Liver.
Mammary.	Ovary.	Pancreas.
Corneal epithelium.	Oviduct.	Intestine.
Lens of eye.	Uterus.	Yolk-sack.
Central nervous system:	Vagina, etc.	Cæcum.
Ganglia.	Striated muscle.	Vermix.
Nerves.	2. Mesenchyma.	Colon.
Eye:	Connective tissues.	Rectum.
Optic vesicle.	Blood.	Allantois (bladder).
Optic nerve.	Bloodvessels.	Notochord.
Olfactory organ.	Lymphatics.	
Auditory organ.	Spleen.	
Mouth-cavity:	Smooth muscle.	
Teeth.	Fat-cells.	
Hypophysis.	Marrow.	
Anus.	Skeleton.	
Chorion:		
Placenta.		
Amnion.		

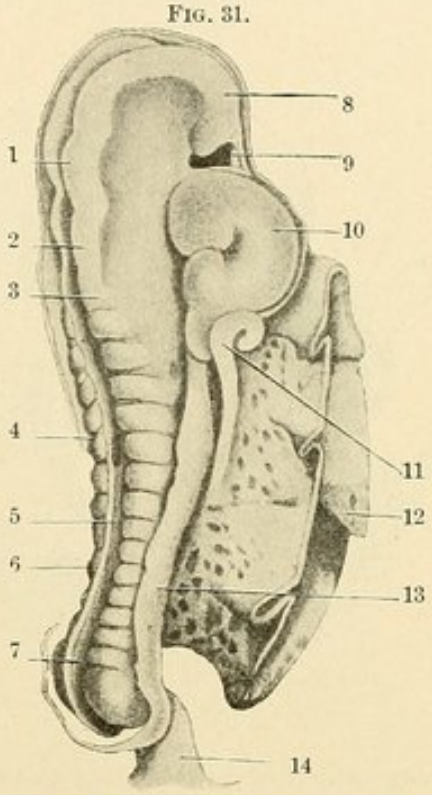
When the epithelial layers of the body are considered it is seen that the organism consists of two epithelial tubes, one within the other. The branches of the inner tube form many of the viscera, while between the tubes are the cavities of the abdomen and thorax. The development of the various organs of the body from the layers of cells described is effected by various formations, by the projection of cell-masses, or by infolding of epithelium.

The central portion or trunk of the embryo is developed at the primitive trace by the medullary plate, a portion of the upper layer or ectoderm, which is of considerable thickness. The edges of this plate gradually turn upward, forming a groove whose sides rise higher and higher, finally arch toward each other, and meet to form a tube. This tube encloses the medullary canal, in which are finally developed the brain and spinal cord.

The notochord is a peculiar embryonic structure which is the primitive axis-skeleton of vertebrates. About the second month of fœtal life it begins to be resorbed and to be replaced by the vertebræ proper.

One of the most interesting phenomena occurring in the development of the embryo is the formation of the organs of circulation and of the blood. The first circulation of nutrient material is effected by transudation, or osmosis, of fluid from the oviduct into the yolk-substance of the ovum. A similar phenomenon occurs during the early life of the embryo after it has become imbedded in the deciduous membranes. The first traces of a heart are found in the cervical region, the heart developing and beginning to beat before the bloodvessels are formed and connected with it. The first circulating fluid found in the heart is clear and without cells. At about the same period the bloodvessels and blood-cells are developed in the vascular area of the yolk-substance outside the embryo proper. The first bloodvessels are channels excavated, as it were, in the yolk-area, which gradually push their way toward the heart and become connected with it. The first blood-cells are also formed in the same area where the vessels are developed, and come through the vessels to the heart. The first blood-cells are red and nucleated; they persist in this condition only during fœtal life, being gradually substituted by the non-nucleated red blood-corpuscles. The first bloodvessels are tubes of protoplasm with isolated nuclei; these vessels gradually become veins and arteries; in the former instance by

FIG. 31.

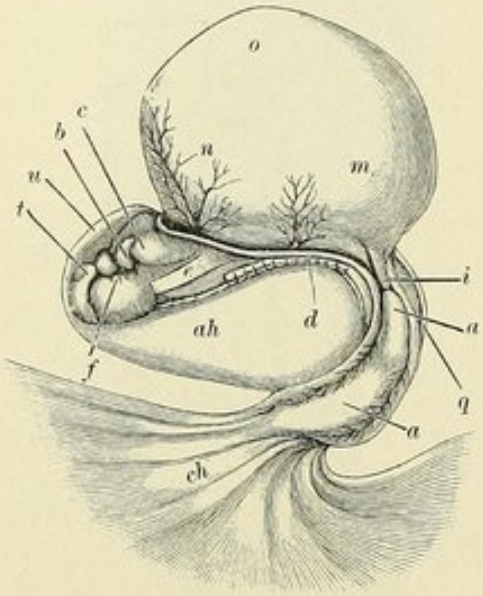


Embryo of thirteen to fourteen days. (SCHULTZE.)

1. Mid-brain. 2. After-brain. 3. Cerebellum. 4. Amnion. 5 and 7. Neural canal. 6. Primitive Trace. 8. Fore-brain. 9. Oral cavity. 10. Heart. 11. Vitelline canal. 12. Vitellene membrane. 13. Border of medullary plate. 14. Allantois.

dilating, and in the latter by increasing the thickness of the vessel-wall. Both bloodvessels develop by the multiplication of cells within the walls. The nucleated red blood-cells are the only corpuscles found at the end of the first month in the embryo's life. They gradually disappear, until, at the end of the third month, they are almost entirely absent. Among the many theories regarding the origin of the red blood-corpuscles that of Schäfer may be quoted, who believes that they originate from the protoplasm of the cells which form the bloodvessels.

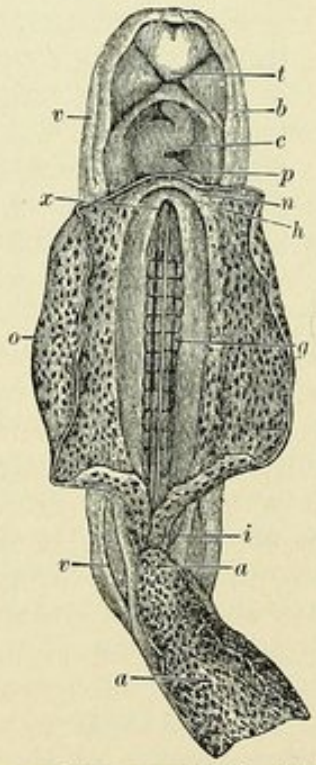
FIG. 32.



Embryo with vitelline membrane, amnion, and allantois. Fifteen days. (COSTE.)

a. Abdominal stalk (allantois) with vessels of chorion (*ch*). *b*. Aorta. *c*. Heart. *d*. Border of abdominal opening. *e*. Œsophagus. *f*. Primitive arches. *i*. Intestine. *m*. Omphalo-mesenteric artery. *n*. Omphalo-mesenteric vein. *o*. Vitelline membrane. *u*. Urachus. *v*. Amnion. *ah*. Cavity of amnion.

FIG. 33.



Same embryo magnified. Vitelline membrane removed.

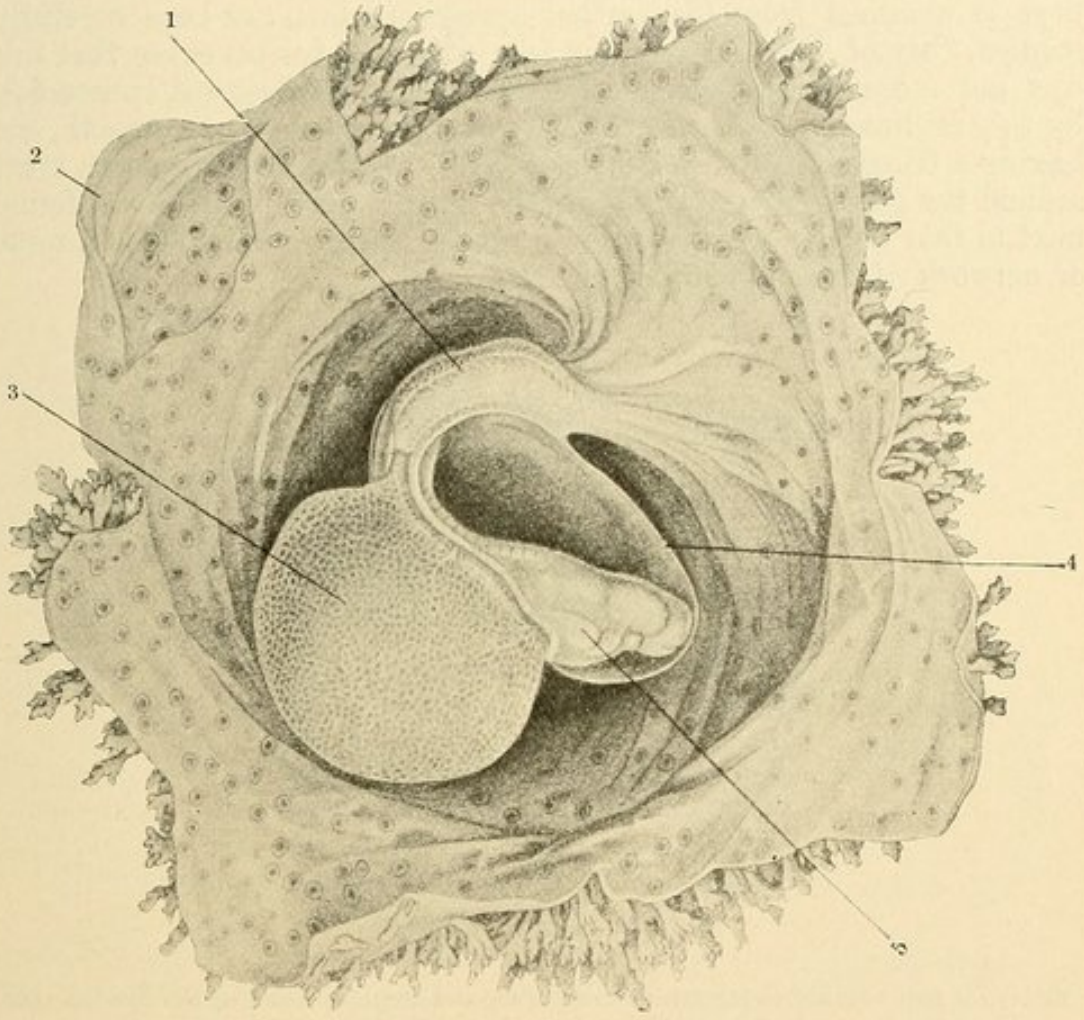
a. Abdominal stalk (allantois). *b*. Aorta. *c*. Heart. *g*. Aorta. *h*, *n*. Umbilical and omphalo-mesenteric vessels emptying into heart. *i*. Bowel. *o*. Umbilical vesicle. *p*. Pericardium. *t*. Anterior cranium. *u*. Ureters. *v*. Amnion. *x*. Bowel.

The first form of the heart is that of a simple tube, one end of which joins the arterial system of the embryo, while the other connects with the venous system of the yolk-substance. Next in interest and importance to the primitive heart and its vessels may be considered the primitive kidney, often termed the Wolffian body; this is a series of tubules arising from a primitive ridge, called the Wolffian or nephridial ridge, located in the embryo just outside of the genital ridge before referred to. From the tubules of the Wolffian body are gradually developed the kidney and also the ducts of Müller, from which are finally developed the female genital organs. As we have already seen, the primitive epithelia from which are developed the germinal elements of both sexes have their origin in the genital fold or ridge of cells

appearing near the Wolffian body. In this area may be found the beginnings of ova and also the nuclei or granules from which are ultimately developed the spermatozoa.

As development proceeds, the two ends of the embryo separate more and more widely from the yolk-substance. As the embryo is yet without an independent circulation, and is still dependent upon the yolk for nutriment, it maintains its connection with this base of supplies through a vesicle or bladder-like body known as the allantois. From the allantois, whose early development is unknown, there gradually develop the two membranes which surround the fœtus, the amnion and the chorion.

FIG. 34.



Embryo with opened membranes. Fifteen to eighteen days. (COSTE.)

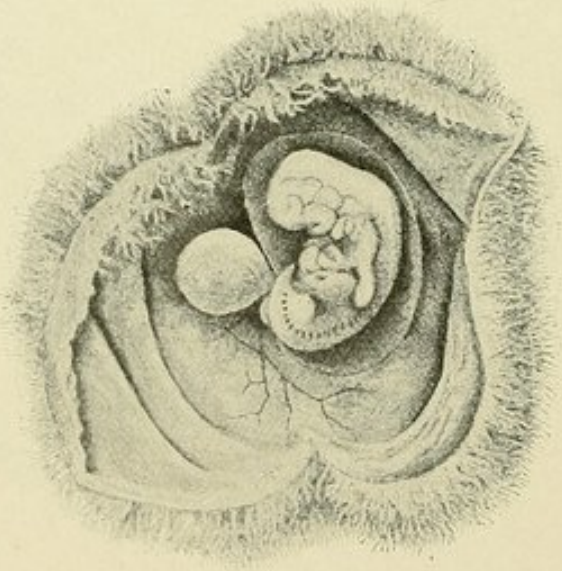
1. Allantois. 2. Parietal mesoblast. 3. Vitelline membrane, yolk. 4. Amnion. 5. Heart.

The great bloodvessels of the embryo, the beginnings of the respiratory tract, and of the important cervical nerves are provided for in the branchial arches, which resemble the gill-arches in other forms of life. From these are gradually developed the aortic arch and other important structures. Side by side with the development of bloodvessels in the embryo itself occurs the growth of capillaries in the "area vasculosa," these vessels gradually widening in their network and communicating with the venous end of the embryonal heart. In the earliest

human embryos examined the vesicle or yolk has been found with a complete development of bloodvessels.

The early development of the amnion, the fœtal membrane which remains always next to the fœtus, is unknown. In the earliest specimens examined this membrane has been found a closed sac about the embryo, and hence no clear idea has been gained of its methods of formation. It apparently rises at the sides of the embryo from the allantois and the edge of the yolk-sac. The chorion, the membrane which always remains next to the uterus or furthest from the embryo, is formed by an outer layer of the ectoderm with an inner layer of mesoderm. It completely surrounds the ovum in the early stages of its development. An interesting idea of the early appearance of the embryo is obtained from the earliest specimen which has been carefully studied, that of Reichert. There is good reason for believing that this was not more than thirteen days old. It was a flattened sphere $3\frac{3}{10}$ by $5\frac{5}{10}$ millimetres. At its two poles or extremities it was smooth, but having a fringe of tuft-like processes (villi) separating the smooth areas around the poles. On opening the embryo a mass of cells was found next to that portion which had been nearest the uterus, and also a mesh or network of threads without nuclei.

FIG. 35.



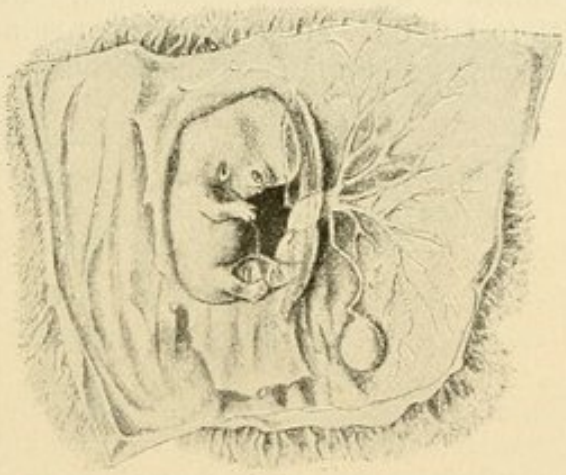
Embryo of four weeks, showing vitelline membrane and chorion. Showing the development of the limbs, heart, and liver. (SCHULTZE.)

The villi gradually spread and become branched, and at about the twelfth or fourteenth day the ovum is enclosed in the decidua, the tips of the villi alone touching the uterine decidua, and thus enabling nourishment to pass through the cells of the decidua into the villi of the ovum. The human ovum is remarkable for the very early appearance and development of its chorion with the chorional villi. As the amnion develops the space between it and the embryo becomes filled with fluid, known as the amniotic liquid.

At the time when the chorion is first fully developed, the contents

of the chorionic vesicle—that is, the embryo surrounded by the chorion—are, first, the embryo, the stalk of the allantois, and the yolk-sac, and also the chorionic fluid. Concerning this but little is known. It is probably analogous to the amniotic fluid, which later plays an important part in the economy of the ovum. The entire chorion is vascular at first, the allantois conveying blood to it from the embryo by means of two arteries, and returning the same with two veins. In this manner the embryo has a circulation before the placenta is formed, or what is known as the fœtal circulation becomes established. The first chorion is entirely covered by villi, which are club-shaped, irregularly formed bodies, subdivided in branches. As has been stated, they do not perforate the blood-sinuses of the deciduous membrane, but are attached by their tips to the surface of the uterine lining. It is believed that they do not, however, enter the glands of the uterus. These villi are at first solid outgrowths of cells from the ectoderm and mesoderm, becoming gradually hollowed out by the formation of blood-vessels. As the ovum grows the villi gradually divide themselves into those which continue to increase luxuriantly, the "chorion frondosum," and that portion of the chorion which gradually aborts or

FIG. 36.



Embryo of eight weeks, showing umbilical vesicle and cord. (KÖLLIKER.)

atrophies, known as the "chorion læve." The reason for the persistence of a portion of the villi and for the disappearance of the rest is found in the fact that out of a portion of the chorion with its villi is formed the placenta, and as all the villi are not needed for this development, the remainder atrophy. In the "chorion frondosum" the bloodvessels develop with great luxuriance. The chorionic fluid may be coagulated by hardening agents, which form a network of threads; this is all that is apparently known regarding its composition.

While the chorion is essentially a very vascular membrane, and is developed for the sake of its bloodvessels, the amnion, on the contrary, is entirely without nerves and bloodvessels, and is composed of several layers of epithelium forming a thin, transparent membrane. The growth of the amnion begins rapidly during the fourth week, and at

the second month there is already considerable amniotic fluid. It derives its cells from the mesoderm and ectoderm, and these epithelia are remarkable for processes extending from one cell to another. Between the cells are spaces of considerable size, making the whole membrane spongy in its meshwork.

Both the fœtal membranes, amnion and chorion, although separated at first during the first two months of gestation, gradually join during the third month. The union between them, however, is always slight, and the two can be readily separated, as is seen in any recent specimen of placenta and membranes. A very important portion or adjunct of the amnion is the amniotic fluid, whose function it is to protect the embryo from mechanical injury, to maintain its temperature, and enable the growing fœtus to move. During labor it moistens the birth-canal of the mother and also the child, although it is not essential to birth, as seen in cases where the fœtus is expelled in its unbroken membranes. Minot justly urges that the amniotic liquid furnishes the embryo with water, and that the fluid itself is formed by transudation from the uterus or from the chorion through the amnion. There is abundant proof that the fœtus swallows the amniotic liquid, and as the amniotic liquid contains but little solids, its value must be chiefly for the water of which it is composed. The amount varies greatly. The composition of the *liquor amnii* is that of a serous fluid. Its specific gravity varies from 1.0005 to 1.0082. Its percentage of salts is between 1 and 2. Vogt and Scherer have tabulated its composition as follows :

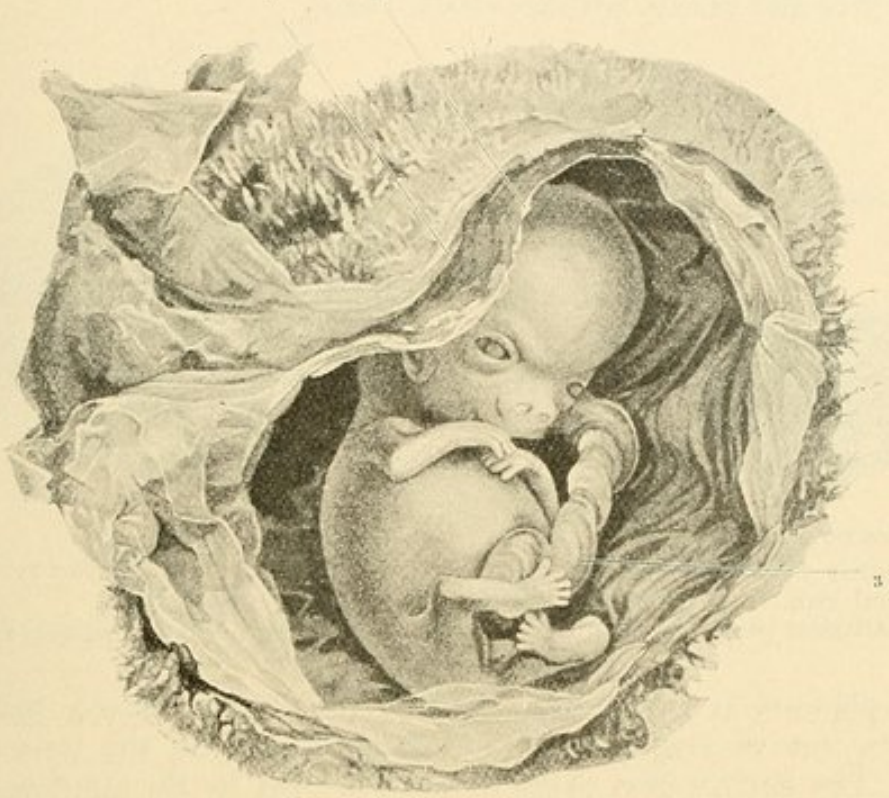
	3 months.	4 months.	5 months.	6 months.	10 months.
Water	983.47	979.45	975.84	990.29	991.74
Albumin and mucin . . .	.....	10.77	7.67	6.67	0.82
Extracts	7.28	3.69	7.24	0.34	0.60
Salts	9.25	6.09	9.25	2.70	7.06

It may be observed from this table that albumin diminishes largely toward the end of gestation, as does also the percentage of salts. Gusserow has shown the absence of fibrin-forming substances in the amniotic liquid. Fehling has ascertained that the percentage of urea is very small, at the tenth month being 0.045 per cent. The facts that the amniotic liquid in composition is a serous fluid, and that it appears before the embryo has excretory organs, are against the supposition that the amniotic liquid is excreted by the fœtus. Experiment has shown that a substance injected into the jugular vein of a pregnant animal colors the amniotic liquid, while no evidence of this substance is found in the fœtus. It seems most probable that the amniotic fluid comes in large part through the amnion from the chorion and from the uterus. It is possible that a small portion may be derived from the fœtus, but this portion must be very inconsiderable.

The nutrient protoplasm which supports the embryo is contained in the yolk-sac, a pear-shaped vesicle connecting with the extremity of the

intestinal canal of the embryo. This vesicle or sac is of the greatest size and importance from the third to the fourth week of embryonal life, when it is nearly as large as the embryo itself, its hollow lined with the cells of the endoderm and mesoderm, and abundantly supplied with bloodvessels.

FIG. 37.



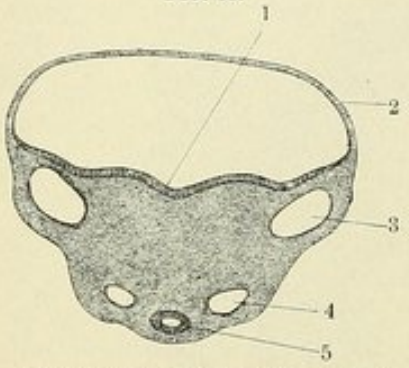
Embryo at beginning of third month. (SCHULTZE.)
1. Chorion. 2. Amnion. 3. Umbilical cord.

In the human subject the first trace of the umbilical cord is found in the stalk of the allantois. The allantois is never a separate vesicle from the embryo, but is instead a cylindrical offshoot or diverticulum. The amniotic membrane has its origin from the sides of the umbilical cord, there being no free allantois, but that vesicle and stalk being a direct communication between the embryo and chorion. As the cord develops it can be seen that it is never covered by the amnion.

The development of the umbilical cord may best be observed in the stalk of the allantois. On cross-sections of the cord its connective tissue is seen in branching cells from the ectoderm and mesoderm, while its bloodvessels enlarge their cells, becoming thick and muscular. At term the cord is whitish in color, twisted in spirals, and varying greatly in length. At the fœtal end, which is narrower than the rest of the cord, the epidermis of the fœtus extends for a short distance upon the cord. At the placenta the chorion and the cord join. Although the cord usually terminates just outside the centre of the placenta, it may join the chorion entirely without the placenta, forming a membranous insertion or velamentous insertion of the cord. The

vessels of the cord must be considered as arranged in spirals, and not as twisted, there being no possible explanation for the twisting of the cord. Its external surface contains epithelium continuous with that of the amnion. Its interior comprises Wharton's jelly, which is embryonic connective tissue, two arteries and a vein, and a few remnants from the allantois. Capillaries, lymphatics, and nerves have not been proved to be present. The arteries are peculiar in being composed of a muscular tissue and intima without elastic tissue.

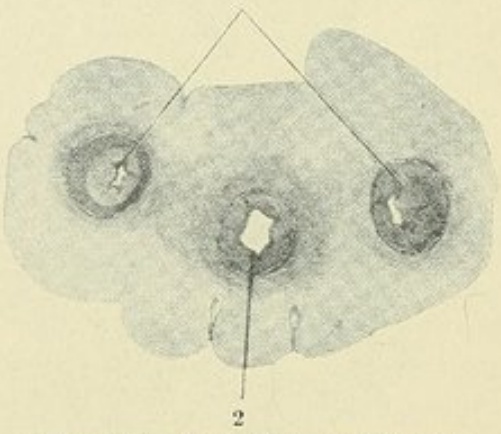
FIG. 38.



Cross-section of allantois. (HIS.)

1. Medullary portion. 2. Amnion. 3. Umbilical vein. 4. Umbilical artery. 5. Allantoic vessel.

FIG. 39.



Cross-section of umbilical cord at term. (SCHULTZE.)

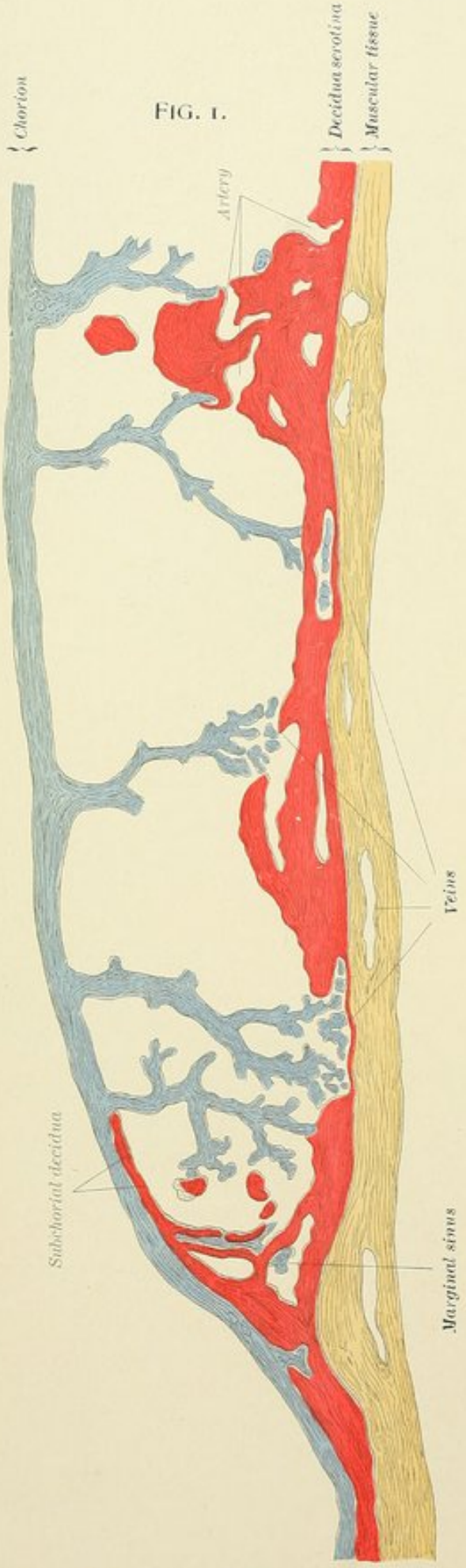
1. Umbilical veins. 2. Umbilical artery.

The placenta is a flesh-like mass of tissue about seven inches in diameter, but varying greatly, and proportionate to the bulk of the child. The surface next to the fœtus is covered by the amnion, and is smooth and reddish-gray in color. The surface next to the uterus resembles somewhat raw beef in color, and divides into areas about an inch in diameter, called "cotyledons."

The placenta grows thin at the edges, passing into the membranes which lie attached around the edge of the placenta. On close examination the cotyledons of the placenta are interspersed with patches and network of flesh-color or pale yellow. This appearance is caused by the villi which are visible through the chorionic membrane. The bloodvessels which pass through the cord branch at the placenta in every direction, and can be followed upon the surface, the arteries being superficial and the veins deeper, although direct anastomosis on the surface of the placenta has not been observed. Over the uterine surface of the placenta there is found a soft, thin, membranous investment, which is the decidua serotina or placental decidua, and which is split into two parts at the time of the expulsion of the fœtus. Sections of the placenta show great masses of tufts, resembling irregular cylinders, which are found on closer examination to be twigs springing in turn from other branches, which can finally be traced to the chorion. The intervillous spaces, filled with blood, form complex channels in the placenta. Arteries and veins of various sizes are imbedded in the vascular cells of the placenta and open spirally into its

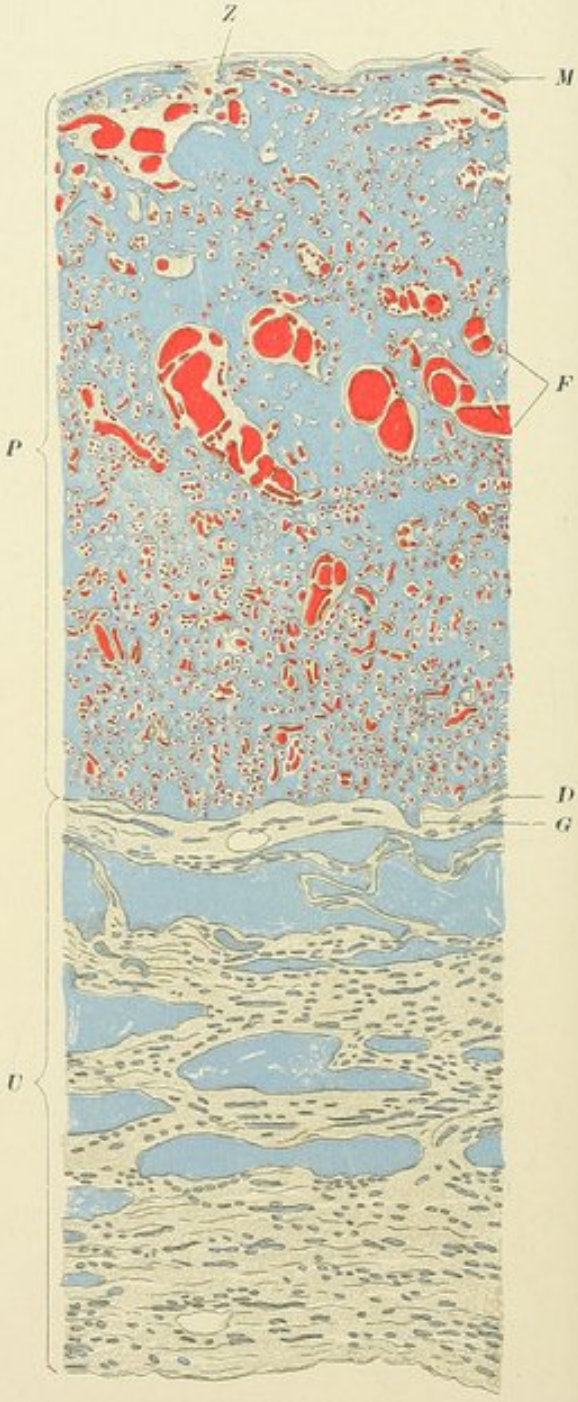
PLATE III.

FIG. 1.



Human Placenta. (HOFMEIER AND SCHULTZE.)

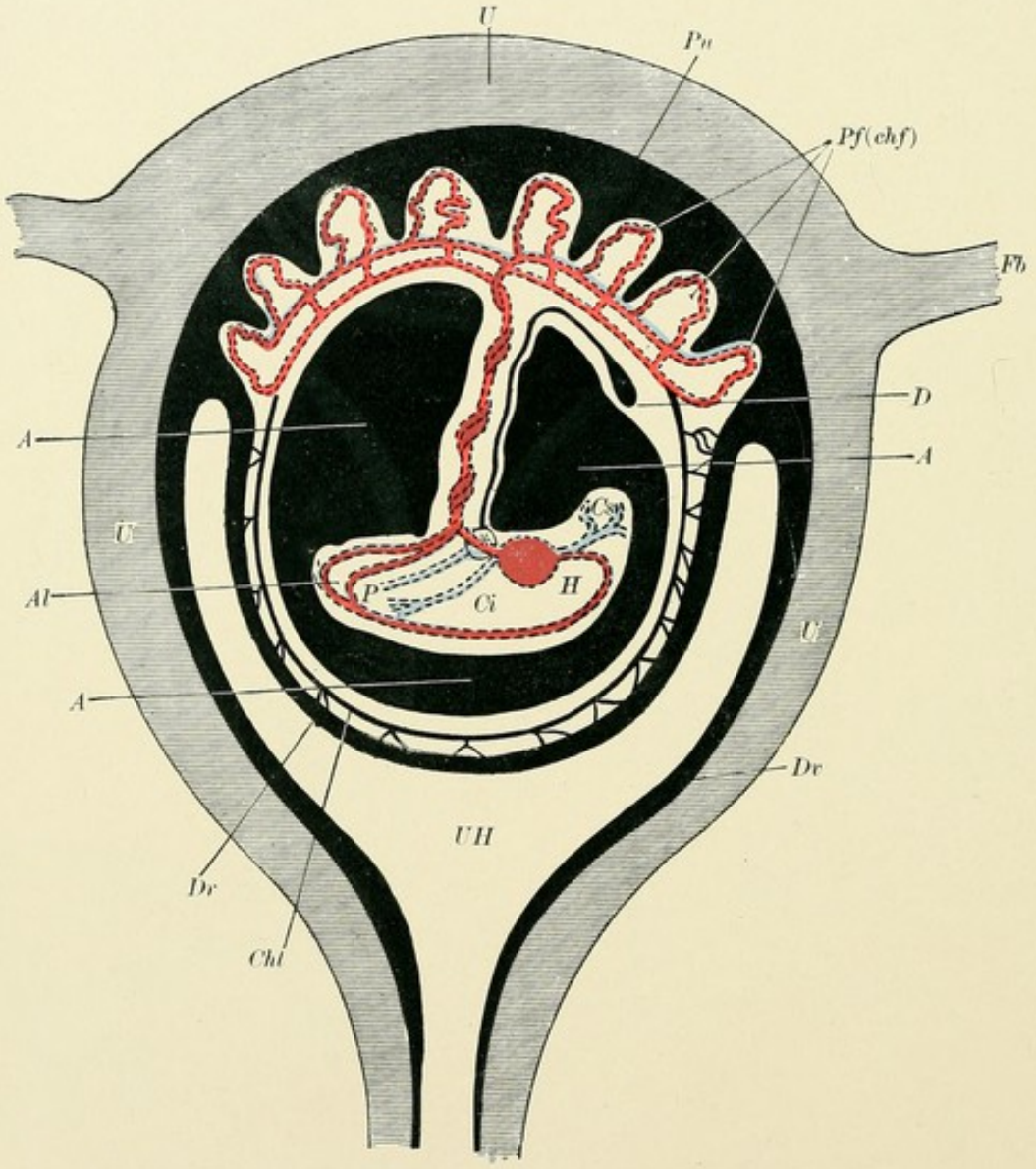
FIG. 2.



Human Placenta and Uterus Injected. (SCHULTZE.)

F. Fœtal vessels (red). *G.* Maternal vessels (blue). *M.* Chorion. *P.* Placenta. *U.* Uterus. *Z.* Origin of villi of chorion. *D.* Decidua serotina. Preparation by Tafani.

PLATE IV.



Section (Schematic) through Pregnant Uterus. (WIEDERSHEIM.)

U Uterus. *Fb.* Tube. *UH.* Cavity of uterus. *Dv.* Decidua vera, which joins uterine placenta at *Pu*. *Dv.* Decidua reflexa. *Pf.* Fœtal portion of placenta (*chf*, chorion frondosum). *Chl.* Chorion lævе. *A*. Amniotic cavity filled with fluid. *H.* Heart of embryo. *Ci* and *Cs*. Inferior and superior vena cava. *P.* Portal vein. *Al.* Artery of allantois (umbilical artery). * Liver pierced by umbilical vein. *D.* Rudimentary vesicle of the allantois.

channels. A placenta, when attached, follows the wall of the womb, its decidual surface being convex, it being thickest at its centre and gradually thinning toward the margin. (Plate III.)

It is no longer believed that the maternal and fœtal circulations directly connect in the placenta, although the exact way in which nourishment is transmitted from mother to child is not clearly known. It is probable, however, that the spaces between the villi are, from the first development, blood-channels for maternal blood, and that the conditions for the passage of nutritious material are thus favorable, whether it be by transudation or by the transfer of masses of leucocytes. (Plate IV.)

As the placenta grows the thickened lining of the uterus degenerates, as if to bring the villi of the placenta into more intimate relation with the blood-channels of the mother. This brings the chorion of the fœtus in relation with the connective tissue of the uterus, whose enlarged capillaries afford nutriment for the vessels of the chorion.

The growth of the fœtus and the precise determination of the age of a given specimen are matters which have occasioned prolonged research and which have not yielded satisfactory results. As regards the size of the fœtus at various periods of gestation, Hecker's data of weight are tabulated as follows :

Month.	Maximum.	Minimum.	Average.
Third	20 grammes.	5 grammes.	11 grammes.
Fourth	120 "	10 "	57 "
Fifth	500 "	75 "	284 "
Sixth	1280 "	375 "	634 "
Seventh	2250 "	780 "	1218 "
Eighth	2438 "	1093 "	1569 "
Ninth	2906 "	1500 "	1971 "
Tenth	.....	1562 "	.....

For practical purposes the table proposed by Dührssen is convenient and fairly reliable :

At the end of 1 month	$1 \times 1 = 1$ cm. = $\frac{4}{9}$ inch.
At the end of 2 months	$2 \times 2 = 4$ cm. = $1\frac{7}{9}$ inches.
At the end of 3 months	$3 \times 3 = 9$ cm. = 4 inches.
At the end of 4 months	$4 \times 4 = 16$ cm. = $7\frac{1}{9}$ inches.
At the end of 5 months	$5 \times 5 = 25$ cm. = $11\frac{1}{9}$ inches.
At the end of 6 months	$6 \times 5 = 30$ cm. = $13\frac{1}{3}$ inches.
At the end of 7 months	$7 \times 5 = 35$ cm. = $15\frac{5}{9}$ inches.
At the end of 8 months	$8 \times 5 = 40$ cm. = $17\frac{7}{9}$ inches.
At the end of 9 months	$9 \times 5 = 45$ cm. = 20 inches.
At the end of 10 months	$10 \times 5 = 50$ cm. = $22\frac{2}{9}$ inches.

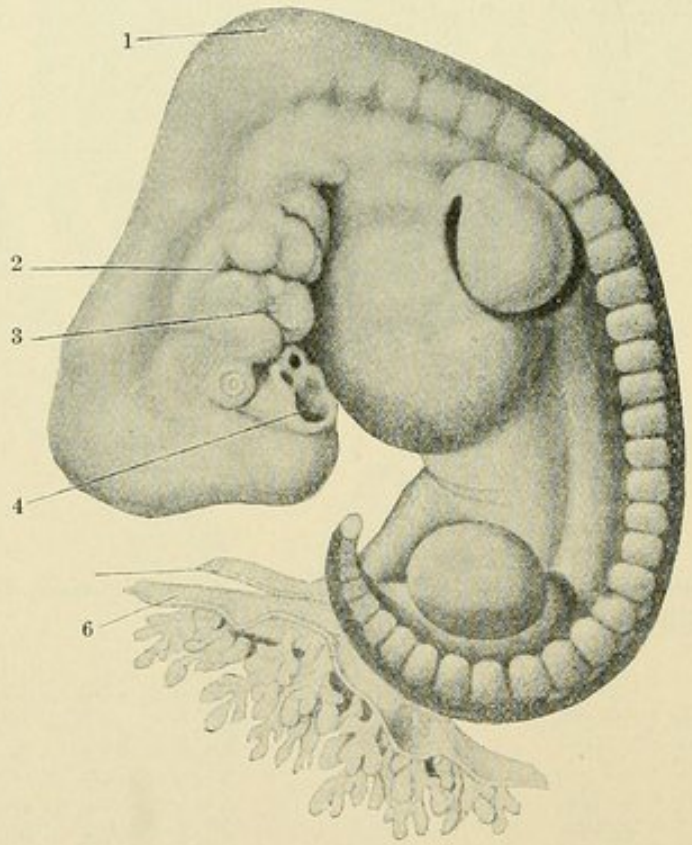
To obtain the length of the fœtus, multiply the month of pregnancy (first, second, etc.) by a coefficient—one for the first month, two for the second, etc., up to five. After the fifth month the coefficient

remains five. Thus, at the seventh month the fœtus is 7 x 5 centimetres long, 35 cm., or 15 inches.

An indication as to the comparative development of the fœtus is often sought in the size of the placenta and the length of the cord. Hecker's statement is as follows :

Month.	No. of observations.	Placenta.	Cord.
Third	3	36 grammes.	7 cms.
Fourth	17	80 "	19 "
Fifth	24	178 "	31 "
Sixth	14	273 "	37 "
Seventh	19	374 "	42 "
Eighth	32	451 "	46 "
Ninth	45	461 "	47 "
Tenth	62	481 "	51 "

FIG. 40.



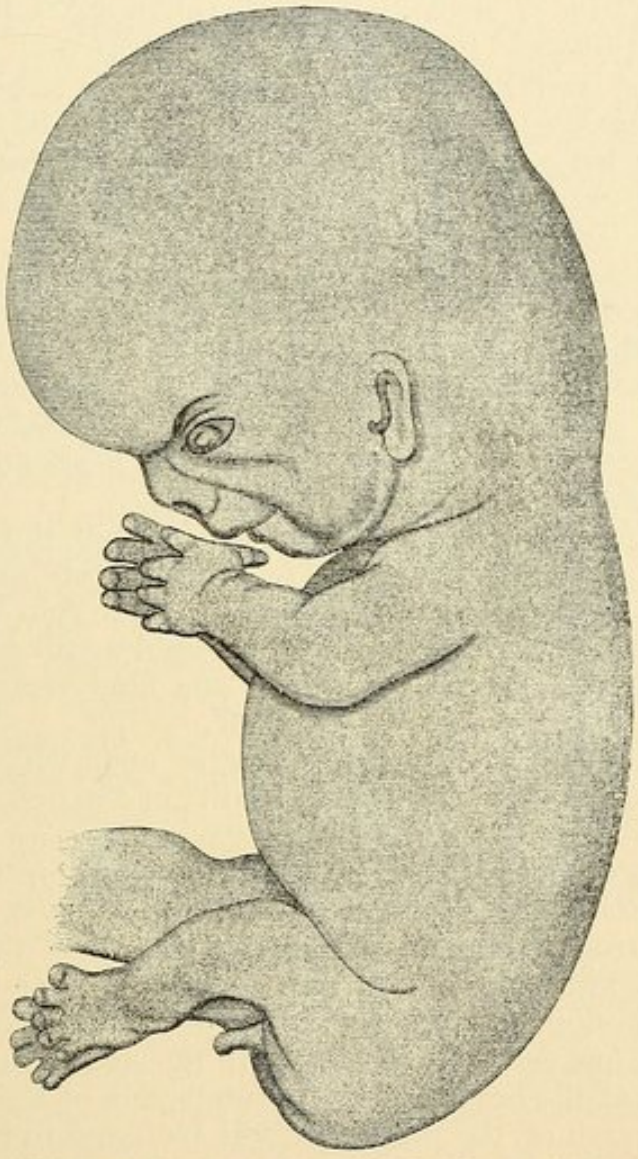
Embryo of four weeks. (HIS.)

1. Cervical spine. 2. Gills (aural opening). 3. Mouth-fissure. 4. Nostrils. 5. Amnion. 6. Chorion and villi.

The weight of the fœtus at various periods of gestation varies greatly. The factors which have to do with the size of the fœtus are many, and are not accurately known. Besides the general factors

which influence nutrition, such as abundance of food or deprivation, exhausting labor, or rest and freedom from mental anxiety, the prolongation or the interruption of gestation probably influences the size and weight of the fœtus more than any other known factor. It is natural to expect that very young mothers, bearing children prematurely, as they do, should have small children, while children born of mothers at the period of greatest maturity and development, between thirty and

FIG. 41.



Nine weeks' embryo. Magnified four times. (HIS.)

thirty-five years, are largest and best proportioned. Gassner states that the child's weight is $5\frac{23}{100}$ per cent. of that of the mother. Frankenhaüser finds a proportion between the height of the mother and the weight of the child. According to him, when the mother is shorter than 4 feet 6 inches the child weighs six pounds and fifteen ounces. When the mother's height varies from 4 feet 6 inches to 4 feet 11 inches the child increases ten ounces in weight; while if the mother is taller than 4 feet 11 inches the child weighs over seven pounds. It is

undoubtedly true that the weight of the child increases with successive pregnancies when the conditions of maternal nutrition are favorable. Negri, from 333 cases, asserts that the children of women who menstruated early are larger than the children of women who developed late.

An examination of embryos of various ages, as given in detail in works upon embryology, affords information of practical value. Specimens examined, aged from twenty-three to twenty-eight days, are enclosed in the chorionic vesicle, and show the embryo in a highly curved condition; the outline of the head is faintly indicated, the region of the neck is strongly bent, the allantois is partially closed, while its pedicle forms the umbilical cord, short and thick. At the end of the first month the embryo has begun to straighten its body, and the rudimentary limbs have lengthened. At thirty-eight days the outline of the fœtus has become distinctly that of the human being. The head has risen, the back become more straight, and the ventral surface of the body is evidently outlined. At fifty days the nose, mouth, and chin can be plainly determined; the cornea and conjunctivæ are separated, the fingers are well developed, and the toes are beginning to divide. At sixty days the soles of the feet are turned toward one another, the toes are free, and the hands are lifted toward the face. At seventy-five days the fœtus has the outline of a young child, with large head and slender body. The beginnings of the nails can be recognized.

Most abortions occur at three months, at which the fœtus presents the outline illustrated in Plate XII. The eyelids are closed, while the nose and lips are broad and thick, and the chin is pointed. At four months the outline of the fœtus resembles still more that of the young child, the limbs being flexed, but the head remaining considerably larger in proportion than is the body.

The characteristics of the fœtus at term upon which reliance may be placed in estimating the degree of vitality of the fœtus are of considerable practical importance. Stress has been laid by various writers upon some one characteristic upon which a positive assertion that the fœtus is at term may be based. Such a method of estimation is, however, erroneous, and a true conception of the development of the fœtus can be arrived at only after taking into consideration its proportions, weight, and general development. The fœtus at term measures about 50 cms. in length, and has definite proportions in the size of the trunk, of the shoulders, and of the head. If the circumference of the chest be measured at the region of the nipples, it will be found to be 35 cms.; the average fœtus being 50 cms. long. If, now, the circumference of the head be measured, passing the tape-line around the forehead and the occiput, the measurement of the average head at term will be 2 or 3 cms. greater than the circumference of the chest, or 37 to 38 cms. When the proportions between the head, the chest-circumference, and the length, already stated, are reversed, the fœtus is not at term, or has been the victim of some disease which has profoundly altered its growth and development. When the measurement about the shoulders, taken just below the acromial process, is less than 32 cms. the fœtus is not at the full period of viability. Before the fœtus has arrived at term,

the difference between the circumference of the chest and that of the head is very much greater than that just stated. In connection with these measurements the weight of the child is of considerable importance, and it is not common for a child born of healthy parents to weigh less than six pounds at delivery at term. In addition to these data, the plumpness and firmness of the child's flesh, the color and bright appearance of the eyes, the freedom and strength of its movements, the vigor of its cry, the strength and rhythm of its heart-beat, all show that normal development is complete or that it has been but partly accomplished. The exact determination of the period of viability is a difficult matter; instances are on record where a fœtus, supposed to be twenty-six weeks old, has grown and thrived. In view of the uncertainty attending calculations based upon data only it is well, in endeavoring to determine the viability of a fœtus, to examine carefully the mother's abdomen before labor to ascertain the period of gestation. In cases where the question arises regarding the viability and period of development of the child more certain information can always be obtained by thorough physical examination than by any computation from data given by the mother as to the period of gestation. In another portion of this book we shall describe alterations in the shape and color of the face and head which occur soon after birth.

From the Wolffian duct and also the duct of Müller are gradually developed the uterus and its appendages. From the early ovarian follicles the ovary is gradually developed, while the Müllerian duct, at first double, becomes by the disappearance of its partition a single duct which forms the uterus and vagina. The rudimentary Wolffian duct persists in the duct of Gärtner; it forms the parovarian duct, which, with the epoöphoron, are found in the broad ligament, sometimes styled the "organ of Rosenmüller." The upper portions of the Müllerian ducts do not unite, but form the Fallopian tubes or oviducts, while the funnel-shaped extremities of the Müllerian ducts become the fimbriated extremities of the Fallopian tubes. It is easy to understand, from the development of the genital tract in the female, those cases of double uterus and vagina which sometimes occasion perplexity in the examination of patients.

The fœtal circulation may be conveniently studied, as it is found during the first four months of gestation and also during the latter half of pregnancy. The essential differences between the circulation of the embryo and fœtus and that of the adult human being are such as naturally result from the fact that respiration is not established before birth. The pulmonic circulation before birth is reduced to a minimum, only sufficient blood being sent to the lungs to maintain the nutrition and growth of these organs. The functions of the right heart are reduced to a minimum before the birth of the fœtus, while the absence of pulmonary circulation affects the metabolism of the liver and renders unnecessary the very extensive circulation of blood found in this organ in the adult individual. As early as the twenty-third day the vessels of the yolk and the allantois become disconnected from the sinus venosus which surrounds the embryo, and the blood on its way to the heart is obliged to pass through the capillaries of the liver. The ductus

venosus gradually develops between the portal vein, just before it enters the liver, and the right hepatic vein. This duct increases rapidly in size, affording a convenient channel for the placental blood to reach the heart without traversing the liver.

The course of the circulation of the embryo during the first four months of pregnancy is well described by Marshall, essentially as follows: Up to the end of the first month the blood returning to the heart, both from the embryo, placenta, and yolk-sac, enters the sinus venosus, and thence through an aperture into the heart passes into the single auricular cavity. The blood in the heart is necessarily completely mixed, and the blood passes out from the heart through the arterial trunk in a similarly mixed condition. After the venous sinus joins the heart in the second month three separate openings are observed into the right auricle; these are the openings of the right and left Cuvierian veins and the posterior vena cava. The septum between the auricles is partially formed, but the foramen ovale permits its free communication between the auricles. The opening of the posterior vena cava lies nearest to the foramen ovale, while the blood is directed by the Eustachian valve, composed of a fold of the wall of the auricle along the right side of the opening, which directs the blood from the posterior vena cava through the foramen ovale into the left auricle. At this period of development the foramen ovale is simply an opening in the auricular septum, without valves, so that a certain amount of direct mixture of the blood must occur. During the third and fourth months, by the disappearance of some of the Cuvierian veins, the whole blood from both sides of the head and from both upper limbs is returned to the heart by what is styled the anterior vena cava. Aside from the coronary sinus, which is very small, but two blood-vessels at this period bring blood to the right auricle; the anterior vena cava, which brings venous blood from both sides of the head and from both arms, and the posterior vena cava, which returns arterial blood from the placenta and from the posterior portion of the embryo and from the yolk-sac. During the fourth month the Eustachian valve gradually develops, permitting the blood to pass from the right to the left auricle and preventing its return. The valve increases in size, and owing to changes in the position and direction of the mouth of the posterior vena cava the whole of the blood returned by this vessel is discharged through the foramen ovale into the left auricle.

In the latter portion of gestation the right auricle receives blood from the anterior vena cava, from the coronary sinus, and the posterior vena cava. The anterior vena cava brings venous blood from the head and arms; the coronary sinus returns venous blood from the walls of the heart; while the posterior vena cava, the largest of the three, brings blood from the posterior portion of the body, the kidneys, and lower limbs, and also from the placenta, intestine, and liver. The right allantoic vein, through which blood returned from the placenta in early development, disappears. The left allantoic vein enters the body at the navel, running forward to the posterior border of the liver. Here it meets the hepatic portal vein bringing blood from

the intestine. When the blood from the mother reaches the liver two channels exist by which it can enter the posterior vena cava. A portion of the blood goes through the afferent hepatic vessels into the liver, and thence through the hepatic veins to the posterior vena cava. The greater portion of the blood passes through the wide ductus venosus into the posterior vena cava without going through the liver. The blood returned to the heart through the posterior vena cava comes largely from the allantoic vein. It is purer and more free from nitrogenous excreta and richer in nutrient material than the blood returned by the anterior vena cava. The blood in the anterior and the posterior venæ cavæ may be termed venous and arterial blood, respectively. The venous blood from the right auricle brought by the anterior vena cava passes, when the auricle contracts, into the right ventricle; thence it is sent through the pulmonary trunk, a small portion only going through the pulmonary arteries of the lungs; and as the lungs are unexpanded, there is considerable resistance to the blood, and but a small portion enters the pulmonary tissues. Almost the entire venous blood from the pulmonary trunk goes through the ductus arteriosus to the aorta, passing down to the bifurcation into the common iliacs, then along the bloodvessels of the lower extremities, but chiefly through the allantoic arteries to the placenta, where it gains nutrient matter and oxygen, and from which it returns through allantoic or umbilical veins.

The arterial blood coming through the posterior vena cava does not enter the cavity of the right auricle, but passes by the Eustachian valve through the foramen ovale into the left auricle; here is added the very small quantity of blood coming from the unexpanded lungs through the pulmonary veins. The blood passes from the left auricle into the ventricle, thence along the systemic trunk through carotids and subclavians to the head and arms. Very little blood from the left ventricle enters the dorsal aorta, for this vessel is already full of blood obtained from the right ventricle through the ductus arteriosus; at this period of development the walls of the two ventricles, being equal in thickness and strength, exert an equal pressure upon the blood of the right ventricle to pass along the arch of the aorta, and upon the blood of the left ventricle to pass backward along the dorsal aorta.

Malformations have been observed in which the aorta was obliterated just in front of the point where it is joined by the ductus arteriosus, and without any essential disturbance to fœtal circulation or to fœtal development. In such a condition, however, the fœtus must perish whenever the placenta separates from the wall of the uterus.

Changes in the Fœtal Circulation at the Time of Birth.

Following the separation of the placenta at the birth of the child the placental circulation is arrested and the vessels of the cord interrupted, while, as the lungs become inflated, the pulmonary circulation is established. The ductus arteriosus and the hypogastric or allantoic arteries shrink and become gradually obliterated. The ductus venosus and that part of the allantoic vein within the body of the child also become obliterated, while the foramen ovale closes. Through these changes

the blood in the posterior vena cava, entirely venous in character, cannot pass into the left auricle because the foramen ovale has closed, but, joining with the blood from the anterior vena cava, passes from the right auricle to the right ventricle. From the right ventricle, owing to the obliteration of the ductus arteriosus, it cannot pass into the aorta, but proceeds through the whole length of the pulmonary arteries to the lungs. It is returned by the pulmonary veins from the lungs to the left auricle, thence to the left ventricle, which sends it to the head and upper limbs and also to the lower extremities. The obliteration of the ductus venosus sends the blood in the hepatic and portal veins through the capillaries of the liver to reach the posterior vena cava. By three changes—obliteration of the ductus arteriosus, obliteration of the ductus venosus, and closure of the foramen ovale—the fœtal circulation has become that of the adult. These changes do not, however, take place instantaneously with birth, nor do they happen simultaneously. The allantoic or hypogastric arteries are first obliterated, partly by contraction of the entire vessels, but chiefly by thickening of their inner coats, the whole process usually complete by the third or fourth day after birth. The allantoic veins and the ductus venosus remain open until the sixth or seventh day. The ductus arteriosus is usually closed by the eighth or tenth day, and is completely impervious in about three weeks. The last of all changes in the fœtal circulation is the closure of the foramen ovale; this closure is produced at first by the valve itself being kept closely applied to the margins of the foramen by the pressure of the increased quantity of blood returned by the pulmonary veins. Later, the edge of the valve gradually coalesces with the margin of the opening, but perfect closure is not complete oftentimes for some months. An oblique valvular aperture, large enough to admit a probe, often persists for the first year of infancy, and may even remain throughout life; in these cases venous blood passes into the left auricle whenever the patient's heart is aroused to violent action, as in overexertion.

CHAPTER VI.

THE PHYSIOLOGY OF PREGNANCY.

In a healthy woman, from the time of conception until the moment of birth, the functions of the organism accommodate themselves to the increased demands upon them. To accomplish this an actual increase in the cellular elements of the body occurs, which resembles the growth and multiplication of the component parts of a fruit-bearing plant.

The generative organs. It is natural that that part of the mother's body which directly contains the fœtus should be the seat of the most pronounced and interesting changes. As the ovum develops, the womb

must also develop to accommodate its inmate. The most important modification in the womb is the formation of its deciduous membranes; these, like the leaves upon tree or plant, develop with the ripening of the fruit, and are cast off after its fall; hence the term deciduous, meaning something which is formed for temporary needs and passes away when those needs are satisfied.

The lining membrane of the pregnant uterus may be conveniently divided into three portions—one which lines the body of that organ, appropriately termed the uterine decidua; the second is that portion directly beneath the impregnated ovum, and upon which it rests; this subsequently develops into the placenta; the third is a layer of decidua which covers the free surface of the ovum, and hence is appropriately termed the ovular decidua. Of these the most important is the placental decidua, whose cells are brought into direct contact with the villi of the chorion, and through which nutrient material and some of the infective germs have been proved to pass. The ovular decidua gradually disappears as the ovum increases in size, until, in a recent specimen, it is not always easy to demonstrate the existence of this membrane. The uterine decidua, although undergoing a general hypertrophy during the development of the ovum, gradually disappears after birth through fatty degeneration. Histological examination of the deciduous membranes shows a free proliferation of decidual cells. In the placental decidua, by the infolding of layers of epithelial cells, the so-called utricular glands, into which the villi of the chorion were thought to be received, are formed. In the uterine decidua, microscopic examination shows large nucleated cells, many resembling an oyster in shape, and easily distinguished from other simple cells of the body. The microscopic appearance of these cells is of interest in view of the diagnosis of ectopic gestation. In the latter condition a discharge of blood and shreds of membrane occurs, the membrane being the uterine decidua. If, in a case having the symptoms of ectopic gestation, shreds of membrane found in the discharge prove, by microscopic examination, to be decidua, the attention of the physician is at once called to the condition present. After normal labor the hypertrophied decidua is cast off in the lochia, the parts returning to their original condition.

The muscular and elastic tissue of the uterus undergoes a very marked development as pregnancy proceeds; the upper contractile portion of the uterus increases greatly through the development of its muscle-cells; while as pregnancy advances the lower uterine segment, or elastic portion of the uterus, becomes gradually developed. The mucous membrane of the cervix shares in the general hypertrophy and secretes a considerable quantity of mucus as a barrier against the entrance of infective germs into the uterine cavity.

The Fallopian tubes share with the uterus in the general hyperplasia of the genital tract. The muscular coat of the tubes and their serous coat become hypertrophied, while the glandular lining increases in cellular elements.

An actual increase in the size of the ovary has not been positively determined. The formation of the corpus luteum of pregnancy and

the differences existing between it and the same body when pregnancy is not present have already been described.

The bloodvessels of the genital tract show a marked tendency during pregnancy to become enlarged and tortuous; this is well illustrated by varicose veins of the vagina, which are of not infrequent occurrence. A similar condition is occasionally discovered in the veins of the broad ligaments. During post-mortem examinations of women dying during or immediately after labor these veins have been found very much enlarged and tortuous.

The vagina becomes during pregnancy darker in color than is normal, being of a dusky bluish tinge; its bloodvessels are sufficiently enlarged to pulsate strongly, and this sign has been taken to indicate the pregnant condition. The mucous glands and follicles of the vagina secrete more abundantly than in the non-pregnant, and in healthy and uncontaminated women this secretion, strongly acid in reaction, forms an antiseptic agent of great efficiency.

In general it may be stated that the muscular and connective-tissue planes of the pelvic floor share in the general hypertrophy occasioned by pregnancy, their increased elasticity providing for the part which they play in the mechanism of labor.

Among the earliest of the changes detected in pregnancy in many cases are those found in the breasts. These organs gradually become larger and firmer, the milk-ducts as they develop becoming appreciable to the finger, gentle pressure causing a watery milk to exude from the nipple. The nipples themselves become larger, and are often sensitive to the touch and sometimes the seat of darting or lancinating pain. The areola of the nipple becomes distinctly pigmented and the natural pigment of the part grows very much darker. Outside of the first zone of pigment there is often formed a second, in the region of small accessory follicles, which are usually found about the outer rim of the areola of the nipple. The increased pigmentation observed in this region is one of the most characteristic signs of pregnancy. There is no pathological condition of the pelvic organs which produces these changes, and while the breasts may enlarge in phantom pregnancy or pseudocyesis, still close examination will reveal the fact that the characteristic anatomical changes are not present.

The **circulatory system** of the mother is profoundly affected as pregnancy advances, the heart undergoing a physiological hypertrophy and the bloodvessels becoming thicker and firmer. The blood of the pregnant patient during the first few months of pregnancy undergoes a temporary reduction in red blood-corpuscles, with an increase in the watery constituents of the blood and a slight increase of the white corpuscles. After the third or fourth month of gestation a physiological plethora ensues, and the blood, instead of being such as is seen in anæmia, becomes characteristic of hyperæmia. As pregnancy advances the amount of fibrin increases, the coagulability of the blood during the latter portion of pregnancy being very pronounced.

Changes in the **digestive organs** occur during pregnancy, as the advancement of this condition and the growth of the embryo bring additional tax by reason of the increased metabolism. The mucous

membrane of the stomach first gives evidence of its altered condition in the increased sensibility which culminates in nausea and vomiting. Some patients suffer from diarrhœa during pregnancy, while most are afflicted with constipation. Examination of the abdominal viscera, the spleen, the liver, and the kidneys shows a condition of engorgement closely bordering upon pronounced congestion. A post-mortem examination of the stomach in early pregnancy finds the mucous membrane engorged, the folds of the mucous membrane are thickened and deeply reddened, the characteristic secretion is greater than normal and is often intensely sour in reaction. In the liver proliferation of connective-tissue cells is constantly going on, with an increase in the epithelial elements of the organ also.

It is in the **kidneys**, however, that some of the most interesting changes occur, which have occasioned much controversy and much discussion. The consensus of opinion, however, is that the kidneys during pregnancy show a condition of engorgement and hyperæmia. While distinct evidence of nephritis in healthy pregnant women is wanting, still the degree of engorgement is so great in many cases that the border-line of the pathological process is certainly reached. Microscopic examination of the kidneys shows some of the epithelial cells in a condition of cloudy swelling, while the condition of general engorgement is very pronounced. The pelvis of the kidney is often dilated, and the ureters may also share in the dilatation in cases in which, for any reason, the ureters have undergone pressure by the pregnant womb. Microscopic examination of the urine not infrequently reveals the presence of epithelial cells from the kidney and also of hyaline casts. Increased pigmentation in the suprarenal capsules is sometimes observed.

In cases of pregnancy uncomplicated by a pathological condition, as pregnancy advances the **lungs** are encroached upon by the uterus and its contents, and a condition of congestion or engorgement may be found at the bases of the lungs. The type of respiration becomes more and more costal, and in cases of polyhydramnios or multiple pregnancy the distress of the mother through impeded respiration may be considerable.

The **heart-muscle**, in common with other muscular tissues of the body, becomes hypertrophied in healthy and well-developed women. Where the arterioles are in good condition and the nervous supply of the vascular system is a normal one, congestion and œdema in various portions of the body rarely occur. Following the maintenance of the erect posture for some time the feet and ankles often swell at night, but the engorgement disappears during the night. In women of weak muscular fibre and in whom the capillaries become readily engorged, swelling of the feet and ankles may be constantly present in a moderate degree. If the urine of such patients be examined, it will be found that serum-albumin is very commonly present, but that evidences of nephritis are wanting. In frail women the occurrence of œdema during pregnancy should lead at once to a thorough examination of the excretory organs. If no pathological condition is found to account for the œdema, the most rational treatment of these patients consists in

ordering an increased amount of rest. They should diminish their active exertion and remain in a recumbent posture for several hours during the day. This simple precaution, with the administration of an easily digested form of iron, is usually all that is required in these cases.

In women of naturally full habit the hypertrophy of pregnancy may become so pronounced as to cause considerable discomfort by excessive action of the heart and sensation of suffocation. While no pathological condition can be found in healthy women to account for these symptoms, they demand regulation of the diet, the adoption of perfectly loose and comfortable clothing, and additional care in maintaining regular action of the bowels.

The **serous membranes** share in the engorgement of the viscera, and often a serous transudate of moderate amount may be found within the cavities of the body. The glandular system is not often appreciably affected, although enlarged lymphatics at the pelvic brim may be detected in ill-nourished and pregnant patients. The thyroid gland distinctly enlarges, often rapidly as pregnancy advances, and goitre, if present, is considerably aggravated. The skin shows the deposit of pigment about the genital tract and about the breasts, as has been described. In some cases pigment is also developed upon the lower and lateral portion of the abdomen and upon the face. It is usually of a dark yellowish-brown color, and may cover sufficient of the face to form what is sometimes termed the mask of pregnancy.

The **nervous system** of the pregnant patient becomes hyperæsthetic, sometimes to a very marked degree. The sensory nerves and the secretory nerves are those usually involved. Abnormal sensations in various regions of the body are frequently complained of, and especially about the vulva. Neuralgias are not uncommon, especially of the nerves supplying the head and face. The secretory nerves show their deranged function most often by salivation. The secretory nerves of the stomach and intestine are also not infrequently deranged, and excessive formation of very sour gastric juice and irregular diarrhœa are often seen. Probably arising from this cause is the excessive flow of very pale urine of low specific gravity, which is not infrequently observed. The nerves of the special senses come to be in a profoundly altered condition, so far as the performance of their function is concerned. The patient is acutely sensitive to unusual sights, sounds, and odors, and often to such an extent as to make her presence in the vicinity of an unusual object which appeals to the senses a very trying thing. Pregnant women complain very often of a sense of respiratory oppression, especially in a warm or crowded room.

In many patients the most sensitive portion of the nervous system is the brain; this shows itself in great hyperæsthesia in the reception of sense-impressions, and also in altered emotional states and in unaccustomed volition. The most common form of disordered cerebration is that of apprehension or melancholia of mild grade. While this is often a purely functional disorder, yet in many cases it is a very valuable symptom of deficient excretion. This apprehensive condition of the mind has reference usually to the patient's approaching labor and to the fate of her child and herself. At other times some imaginary

variation in the affections of herself or of others seems greatly to disturb the mind. In healthy pregnant patients, after the first inconvenience of nausea and vomiting is passed, the mental condition is that of pleasant anticipation and quickened emotion. Violent aversion or profound melancholia are symptoms which should occasion anxiety lest a pathological condition of importance may underlie them.

The nausea and vomiting of pregnancy are never pronounced features in a healthy patient. It is not uncommon for such a woman to experience slight nausea for a few moments immediately after rising in the morning; oftentimes this does not go to the extent of emesis, while with others the prompt ejection of a small quantity of acid mucus is followed by the disappearance of the symptom. When nausea persists after the patient has risen, or when it is experienced with the patient in the recumbent posture, the case must certainly be looked upon as pathological, and not to be included in the consideration of normal pregnancy.

The form and stature of the pregnant patient are considerably changed as gestation advances. The skeleton is increased very frequently the fraction of an inch in length, and correspondingly in the breadth and in weight. The appearance of a healthy pregnant patient is that of physiological plethora. The changes in the contour of the form are effected by the increase in the size of the abdomen and of the mammary glands and the changes in posture which naturally follow. In the early months of pregnancy the weight of the womb and its contents is not sufficient to occasion marked alteration in the posture of the patient. As the womb rises into the abdomen it rests in a position of right lateral obliquity in the majority of cases, the fundus of the uterus being slightly to the right of the spinal column, and the cervix and lower uterine segment directly and obliquely toward the left. Up to the ninth month the fœtus rests slightly against the brim of the pelvis to the left of the median line. In the normal primigravida the elastic strength of the uterus and abdominal wall is sufficient to retain a symmetrical and ovoidal contour in the abdominal region. The widest portion of the abdominal tumor is just above the umbilicus, while the narrower portion is toward the brim of the pelvis. To carry the increased weight in the abdomen the patient naturally throws the shoulders backward and bends the dorsal spine backward. Where the body is not fettered by corsets the carriage of such a patient is not ungraceful nor especially noticeable if she be loosely clad.

In pregnant women who endeavor to conceal the abdominal tumor by tight lacing the body is often bent slightly forward to relax the abdominal wall. The carriage of such a patient is even more constrained and awkward than that of the corset-wearer who is not pregnant. In women deficient in muscular strength, or in whom the abdominal wall has been weakened by successive pregnancies, the abdomen loses its symmetrical and ovoidal contour and bulges at the sides. In such women the fœtus is carried higher in the abdomen than is the case with the primigravida of good muscular development. As gestation advances the contour of the abdomen changes in primigravidæ about two weeks or ten days before labor, when the fœtus

descends into the brim of the mother's pelvis; the result is a flattening of the upper portion of the abdomen from side to side. The ease with which a healthy pregnant woman, of good muscular development, comfortably dressed in loosely fitting clothing, can walk or can move, and can even exert considerable force, is a very interesting example of the mechanical compensatory apparatus of the skeleton and muscular system.

Under the term Hygiene of Pregnancy is included such care of the patient as she is able to take herself, and without the immediate attention of her physician. Among the most common mistakes which women make during pregnancy is overexertion. This injurious exercise of energy does not lie so much in the direction of manual labor as in those exhausting and nerve-trying occupations, many of which are peculiar to woman's sphere. The fact that considerable muscular exertion can be indulged in without detriment to the patient or her child is proved by the good health and easy labors of primitive women and also peasant and other working-women who enjoy sufficient food and adequate shelter.

The modern woman in the pregnant condition often undertakes to maintain the so-called social duties which fritter away a large amount of energy under the most unfavorable conditions, and the result is often disastrous. It is one thing for a pregnant woman to work in the open air or to do light housework, and another for a woman in this condition to ride in street-cars or steam-cars a considerable distance, to visit crowded shops, standing upon her feet for some time, or to undergo the fatigues incident to modern society observances, with the crowded rooms, late hours, and indigestible food which commonly accompany such occasions. The sensations of the patient herself naturally impel her to avoid public places, and to remain quietly with her family or engaged in quiet and simple occupation.

Of all forms of exercise suitable to pregnancy, walking is the best. The patient should walk upon a level, preferably in the hours of sunshine, and never to the point of fatigue. When pregnancy is sufficiently advanced to alter the contour of the figure patients are accustomed to walk at evening in the company of a suitable person, thus avoiding observation upon the street. Those who can use carriages should be encouraged to drive slowly, in easy carriages and over smooth roads. The worst forms of muscular exertion for pregnant women are lifting, straining, reaching, as in raising the arms high above the head to some distant object, and the use of the sewing-machine driven by a treadle. Abortion following such forms of exertion is sufficiently frequent to illustrate the truth of this statement.

The patient should early seek the advice of her physician as regards her clothing. In but the warmest weather woollen of suitable thickness should be worn next to the skin. Combination suits (shirt and drawers in one piece) are especially suitable. Stockings should be thin wool or silk. If the patient has been foolish enough to wear corsets, they should be laid aside so soon as pregnancy is detected. The skirts should be as few as possible, and if the combination suit is worn and woollen tights are put on before going into the street, the number of

woollen skirts can be reduced to a minimum, and often but a single skirt, and that muslin, is all that is necessary. Whatever skirts are worn should be suspended from the shoulders, preferably by waists to which the skirts are attached by buttons. Dresses should be made to fit the figure loosely, skirt and waist in one piece, to avoid constricting the abdomen. For house wear, wrappers of different sorts are found comfortable and suitable. The patient's stockings may be kept up by long garters attached to the lower edge of the waist which supports the skirt. Her house shoes should be warm enough to prevent her feet from becoming cold, and all footwear should be large enough to avoid pressure upon the feet and ankles. The importance of proper dress during pregnancy cannot be realized except by patients who have had experience in successive pregnancies with proper and improper clothing. Many cases of obstinate constipation in early pregnancy, with displacement of the womb and its accompanying symptoms, may be traced to corsets or tight clothing compressing the abdominal and pelvic viscera during early pregnancy. Wraps of the lightest sort are found comfortable and convenient during this condition.

The patient's disturbance in appetite during early pregnancy usually results in a very marked diminution in the amount of food taken during the first month of gestation; appreciating this fact, the patient should take easily digested food in small quantities as frequently as her digestion will permit. If the sight of food is nauseating, or if the sight and odors of a meal served at table are disagreeable to her, she may well feed herself every four to six hours with small quantities of milk, soup, broth, eggs beaten up with milk, and other forms of light and easily digested food. Variations and perversions in appetite, which are considered by some the natural consequences of pregnancy, are usually found to depend upon some abnormal or diseased condition of the stomach, and are not necessarily the result of pregnancy at all. Attention should be paid to variations in the appetite of the patient, as oftentimes her fancies or dislikes are the result of some reflex irritation originating in the genital organs or caused by a diseased condition of the stomach and liver which requires appropriate treatment.

The practitioner is often asked by women regarding the influence of their appetite upon the size of the child, and hence upon the ease or difficulty of its birth. There can be no question that a diet which contains but little bone-forming material must result in a deficient development of the bones of the skeleton. Those who believe this are accustomed to recommend warmly a diet of fruit with the exclusion of meat for the pregnant patient. There can be no question that fruit is an excellent article of diet during gestation, but not for the reason often described. Pregnant women suffer very frequently from constipation, and the free use of fruit as an article of diet is one of the most advantageous methods of obviating this difficulty. Many fruits contain also acids which act as mild diuretics, and thus assist in elimination. After the first four months of gestation have passed there can be no objection to the patient enjoying a varied dietary, provided food taken is agreeable and does not disturb digestion. The sorts of food best adapted to a pregnant patient have already been indicated, and should embrace

simply those which are easy of digestion and thoroughly palatable. Abnormal appetites in pregnant women and so-called cravings and longings of pregnancy can often be found to be the result of a lack of proper and nourishing food. A pregnant patient should be fed in small quantities frequently, if the stomach will not tolerate a full meal. She should be instructed to take an abundance of pure water and to avoid, so far as possible, stimulants and narcotics of every form. In rare cases as pregnancy advances the appetite becomes excessive. Large quantities of food are taken three and four times daily, and at labor the fœtus in such cases is frequently found of excessive size, occasioning difficulty in delivery. Such a patient would do well to avoid large quantities of meat, limiting herself to bread, milk, fish, oysters, fruit, and vegetables for diet.

There is no function more often disturbed in pregnant patients than the action of the bowels. Too much stress cannot be laid in instructing patients upon the necessity of securing a daily evacuation of the intestines. Suitable diet will assist greatly in securing this result, and, in addition, the patient should be entrusted with the simplest methods of treatment to secure daily evacuation. The importance of habit must be urged upon her, and she must be instructed to endeavor to move the bowels at a certain time on each day. Failing in this, gluten suppositories, glycerin suppositories, and enemata are of value. Rectal injections during pregnancy should not be very large in amount nor excessively hot or cold. Eight ounces of fluid at a temperature a little less than blood-heat, from 80° to 90° F., often secure a desirable result without disturbance. These injections may be castile soapsuds, or a half-ounce of castor-oil mixed with eight ounces of soapsuds, or a half-ounce of glycerin and a half-ounce of Epsom salts dissolved in eight ounces of warm water. If hardened fæces are suspected to be present, ox-gall may be dissolved in warm soapsuds and used to advantage. It is often better, where the patient must use injections for some time, to avoid hot injections and to use those which give a sensation of coolness when introduced within the body. There is little danger of inducing abortion, if gentleness be practised in making the injections, if the material of the injection is non-irritating and the temperature neither very high nor very low. A most important aid in avoiding constipation is proper clothing, and the value of this can scarcely be realized except in cases in which obstinate constipation has been caused by improper clothing, and a marked relief has been seen to follow the correction of this fault.

Rectal injections should not be employed habitually by pregnant patients. The mucous membrane of the rectum is usually congested during pregnancy, the hemorrhoidal veins are dilated, and it is very easy for the constant use of rectal injections to set up a condition of obstinate irritation, or to aggravate existing hemorrhoids or catarrh of the rectum. A better form of treatment is to be found in sitz-baths; these require for the patient's comfort a suitable tub with the back sufficiently high to enable her to rest comfortably during the bath. The water should be deep enough to cover the entire pelvis, and of a temperature which causes no discomfort during the bath and leaves a

distinctly stimulating effect afterward. Salt may be combined with the water employed, and will often produce a very agreeable and stimulating effect. In cases where the patient complains of itching and burning sensations the addition of bran or of bicarbonate of sodium will often give comfort. The preferable time for taking the sitz-bath is a half-hour or an hour after breakfast, the duration of the bath being from ten to twenty or thirty minutes, an effort being made to empty the bowel immediately afterward. Under proper precautions such baths not only do not tend to produce abortion, but are valuable aids in relieving conditions which favor the occurrence of such a complication.

Where a patient cannot take such baths, and has but limited facilities for bathing, a sponge-bath of the pelvic region of the body may be used to advantage. The water should be sufficiently cool to cause a slightly stimulating effect; the bath should be taken after breakfast, and should be followed by a movement of the bowels.

The value of exercise during pregnancy to maintain digestion and avoid constipation is very great. The best exercise is walking at a comfortable rate of speed upon a level surface. Climbing of long stairs, lifting, using any machine which has a treadle, or maintaining any strained and uncomfortable posture for a considerable length of time are injurious and may produce abortion. Exercise in the open air is always desirable, and, if a patient is properly clad, may be taken in nearly all weathers except during the most severe storms. A low temperature, if the air be dry, is no contraindication to outdoor exercise during pregnancy. The depressing influence of heat is much more potent, and pregnant women should not exert themselves when exposed to the rays of the sun during the heated term.

Another important factor in the maintenance of digestion during pregnancy is the free consumption of water. Many pregnant women are habitually thirsty and are greatly annoyed by an excessive secretion of urine. Others complain that the skin is unusually dry, while some are distressed by excessive perspiration. An habitually dry skin points to a deficient excretion requiring attention, while excessive perspiration indicates that the skin is endeavoring to perform a portion of the work which should be done by other organs. Constipation can often be avoided or very much lessened by so simple a thing as the taking of cool water, either before breakfast or within an hour after the meal. Soft water is preferable for this purpose, but, as this cannot be readily obtained, water should be chosen, if possible, which is not excessively hard. Where acidity of the stomach and morning-sickness are annoying plain soda-water or light Vichy often gives great comfort. A patient in good health should consume from a pint and a half to three pints of pure water during each twenty-four hours, and will find herself greatly benefited by the use of this agent. Patients are occasionally seen who can take only hot water; these women often suffer from excessive nausea, and so soon as the first few months of pregnancy are passed they find themselves growing better and naturally able to take water at a less high temperature.

Constipation can also be avoided during pregnancy by a judicious

selection of diet. While patients ordinarily think themselves competent to select food in accordance with the appetite, still the physician often errs by making his directions regarding it too indefinite and not sufficiently exact. If constipation is a constant factor with a pregnant patient, her diet should be carefully selected in accordance with well-known observations upon the effect of various articles of food on the intestines. Such a patient should not eat beef in large quantities; but if her appetite craves meat, she should satisfy it with mutton and lamb, with fish, and with the more digestible sorts of birds. Fruit is of primary importance, and especially apples, oranges, grapes, and peaches in season. When raw fruit cannot be easily digested it should be cooked without a large amount of sugar. Vegetables in season should be used freely, and will tend to maintain a proper action of the intestines. Salads with simple dressing, with vinegar and oil, salt and pepper, are useful with many patients. Whole wheat, cracked wheat, Graham and rye, fine hominy, and oatmeal are very valuable in these cases. Such preparations of the various grains contain all of the nutritive principles necessary for the nourishment of mother and child. When combined with cream and salt they are exceedingly nourishing, and influence the action of the intestine in a very favorable manner. Many pregnant patients crave sweet articles of diet; these are best taken in the form of light puddings and the best ice-cream of simple varieties, taken not frozen hard but partially melted. The habitual use of either tea or coffee tends to aggravate constipation in these patients, and should, if possible, be avoided. Women who have been accustomed to drink wine or beer before pregnancy may continue the moderate use of these articles of diet during gestation. The white wines tend less to constipation with most patients than do the red. Attention has been called to the fact that most of the abnormal appetites and so-called "longings" of pregnant women are the result of an abnormal condition of the stomach, and are not at all necessary to the pregnant condition. Patients sometimes crave very salt articles of diet, as salted fish. It is usually best to introduce salt into the food with some digestible article of diet rather than by employing so indigestible a thing as salted fish or meat.

Few patients go through pregnancy without employing at some time various drugs for the relief of constipation. The use of remedies for this condition is a matter of considerable importance, because such patients must have relief, while the fact that the condition lasts so long easily tends to the injurious employment of remedies whose use is justifiable for a comparatively short period. In prescribing for these patients the conditions present must be borne in mind. The opportunity is occasionally given to examine the intestines of women dying during pregnancy or shortly after labor. If the large intestine of these patients be carefully observed, it will be found that in cases in which the clinical history states that the bowels have moved daily there will still be detected dried fæces adherent to the wall of the intestine in small particles, resembling coarse sand or plaster. Such accumulations are most common at the flexures of the large intestine, because the pressure of the gravid uterus naturally favors the retention of fæcal matter at

these points. It is often exceedingly difficult to remove thoroughly such fæces without excessive purgation. It is far better to attempt in each patient to prevent their lodgement so far as possible.

Recalling this condition, and also the mechanical obstacles to the peristalsis of the intestine which are present, it will be readily seen that any remedy prescribed for the relief of constipation in this condition should stimulate the muscular fibre of the bowel and promote the free discharge into the intestine of its normal secretion. While it is essential to secure a free flow of bile, it is often easier to stimulate the bowel to healthy activity than continually to urge the liver in the performance of its function. The best remedy for habitual use by pregnant women is cascara sagrada, which may be taken in fluid extract or cordial. The dose of the former is from 10 to 30 drops, and of the latter from one to six or eight teaspoonfuls, this amount to be taken in one dose in the morning or to be divided into two doses, half to be taken at bedtime and half on the following morning. The existence of pregnancy naturally contraindicates the employment of remedies which might stimulate the uterus to contraction; hence nux vomica, a most useful remedy in ordinary cases, must be employed, if at all, with caution. Aloes is also an unsafe remedy because of its tendency to further congestion in the pelvic viscera. Extract of belladonna, combined with podophyllin, is indicated in cases of deficient secretion of bile associated with painful discharges or irregular action of the intestine. The following formula will be found convenient in these cases :

Resinæ podophylli . . . . . grs. 5.
Extract. belladonnæ . . . . . grs. 2½.
Ft. in pil. No. 20.
Sig.—One at night.

Manna and tamarinds are also available with these patients, and may be used for some time without losing their effect.

While the means described will ordinarily prevent excessive constipation, still all pregnant patients are subject at times to accumulations of fæces which require more active remedies. These should be selected from those drugs which efficiently loosen and dissolve fæcal matter. If the patient's tongue is furred or coated, the following capsule may be given to advantage :

Hydrarg. chlor. mit. . . . . gr. 1.
Sodii bicarbon. . . . . grs. 2.
In one capsule.
Sig.—To be taken at bedtime.

This is to be followed in the morning by citrate of magnesia in sufficient quantity to produce several free evacuations. Where the tongue is clean, but the bowel-movements have been more solid and dry than is normal, compound liquorice-powder may be used in doses of one-third to one teaspoonful, taken at night, and, if necessary, repeated on the following morning. The composition of this powder, namely, senna, washed sulphur, and other less important ingredients, makes it

a very appropriate remedy in such a condition. Pregnant patients who are annoyed by hemorrhoids often find this a very excellent laxative.

In cases in which the remedies already mentioned seem to lose their effect, and especially with patients who suffer from a tendency to congestion in the capillaries and venous engorgement, the vegetable cathartic pill of the Pharmacopœia of 1890 may be used for several days with great relief. This pill contains compound extract of colocynth, extract of hyoscyamus, extract of jalap, extract of leptandra, resin of podophyllin, and oil of peppermint.

Where pregnant patients complain of pain along the course of the large intestine the attending physician should examine them by palpation to ascertain the presence of masses of hardened fæces. Such can often be detected in women in whom the abdominal wall is thin and relaxed. It is often impossible to remove these masses without purgation so violent as to jeopardize the continuation of pregnancy. In these cases the better procedure is to pass a rectal tube as gently as possible as far into the bowel as it will conveniently go, and to inject ox-gall, 60 grains, or one teaspoonful of dried ox-gall, dissolved in one quart of warm castile soapsuds. The addition of four ounces of olive oil to this mixture often facilitates its action. The patient should lie upon her left side during this injection, and the fluid should be retained as long as possible. As the giving of such an injection requires skill and experience, it can best be done by a nurse, who should remain with her patient until the injection has acted. If this be given with caution, suffering will not result and a good effect is obtained. In cases in which the pregnant womb is forced backward against the bowel the position of the uterus may be improved if such an injection be given with the patient in the knee-chest posture. Considerable aid will be afforded to the uterus in its passage out of the pelvis at about the fourth month of gestation by such a procedure.

Much attention has been given to the conditions best adapted to secure tranquillity for the nervous system of the mother, in view of the possible influence of profound impressions upon the child. Under the title of "maternal impressions" are recorded cases where malformation of the fœtus has followed and apparently been caused by some sudden and profound nervous shock. While the absolute relationship of cause and effect may not positively be demonstrated, still the evidence points strongly to a causal relationship between the marked impressions and abnormalities in the fœtus. On the contrary, it has been believed that subjecting the mother to pleasurable surroundings and placing before her objects of beauty tend not only to her own happiness, but to the favorable development of her child. The natural inclinations of the mother prompt her to avoid that which is terrifying; in so far as possible these inclinations should be gratified. It is certainly true that predominating tastes on the part of the parents influence profoundly the tastes and development of the child.

There is every reason for surrounding the pregnant patient with only those influences which tend to tranquillize and to produce agreeable sensations in mind and body. Not only is this true, but the period of pregnancy is also a critical time with the mother as well as

with her unborn child. A latent tendency to disease in the mother may assume an active character during pregnancy, and rapid failure of strength in such cases is often observed. This is especially true in tuberculous patients and in those afflicted with chronic forms of slowly developing maladies. Only the most thorough scrutiny of the patient during her pregnancy can establish the fact that she is enduring this tax upon her strength successfully, and that no latent weakness is assuming the dangerous proportions of an active disease.

The period of pregnancy is also a critical time for the patient and her offspring, not only by reason of physical disease, but because of the possibility that habits may be formed during this time which may influence the fœtus. The weakness from which many patients suffer, especially in the early months of pregnancy, instinctively demands a stimulus for its relief. Alcoholism is sometimes developed during pregnancy, and if it does not assume the acute type, it may develop, especially if alcohol is taken, during the puerperal period. When we consider that lactation often furnishes an excuse for taking alcohol during the lying-in period, we must not be surprised if a latent appetite may become pronounced upon the patient's convalescence. The necessity for the use of alcohol in the pregnant or puerperal state rarely exists, and physicians will do well to choose carefully their forms of tonics if an hereditary predisposition or acquired taste for alcohol is present. The same is true of narcotics, which are rarely if ever needed in the puerperal state.

In general, the pregnant state is one of critical importance to mother and child. In women of good natural strength and amid favorable surroundings pregnancy results in increased development without disease. On the other hand, many women are unable to meet the tax of this condition in either its mental or physical aspects, and if they survive it, it is to continue to live as invalids.

CHAPTER VII.

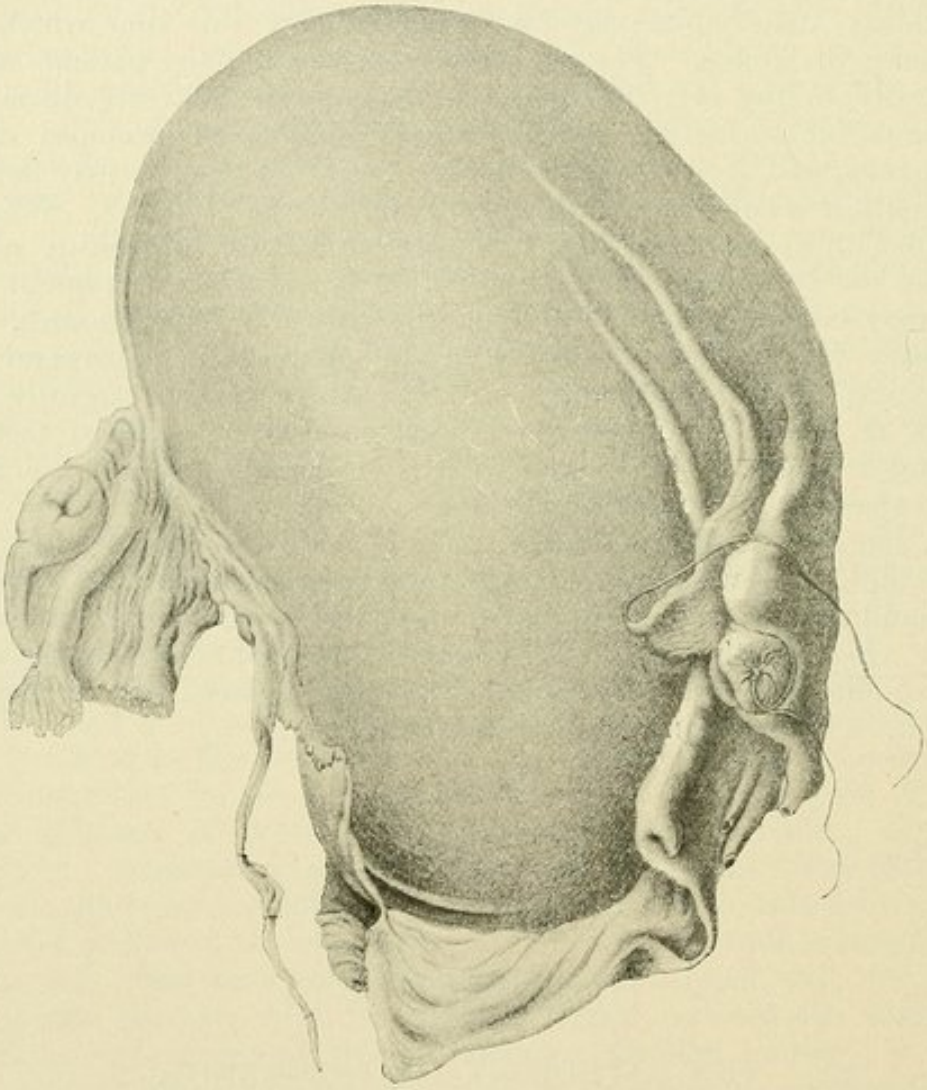
THE PATHOLOGY OF PREGNANCY.

In normal patients surrounded by favorable conditions the state of pregnancy borders closely upon a pathological state. It requires but a little in many cases to change the balance to the side of disease and to transcend the physiological and produce pathological conditions in pregnancy. It is natural to look for pathological conditions in those organs of the body which are most greatly changed by pregnancy, and hence the genital tract presents most frequently pathological variations during the pregnant state.

Displacements of the uterus. The pregnant uterus may differ from the womb normally in its location in the body; although the position of

the pregnant uterus, like that of the non-pregnant, is not fixed, still in the majority of cases it is found in right lateral obliquity in the abdomen. The inclination of the womb toward the right is occasionally excessive and has given rise to a suspicion of extrauterine pregnancy upon the right side. The pregnant uterus is rarely anteflexed or anteverted by reason of the pregnancy. In poorly developed uteri, sharply anteflexed, the uterus is sometimes found forced down into the pelvis with its anteflexion and anteversion greatly exaggerated. These cases

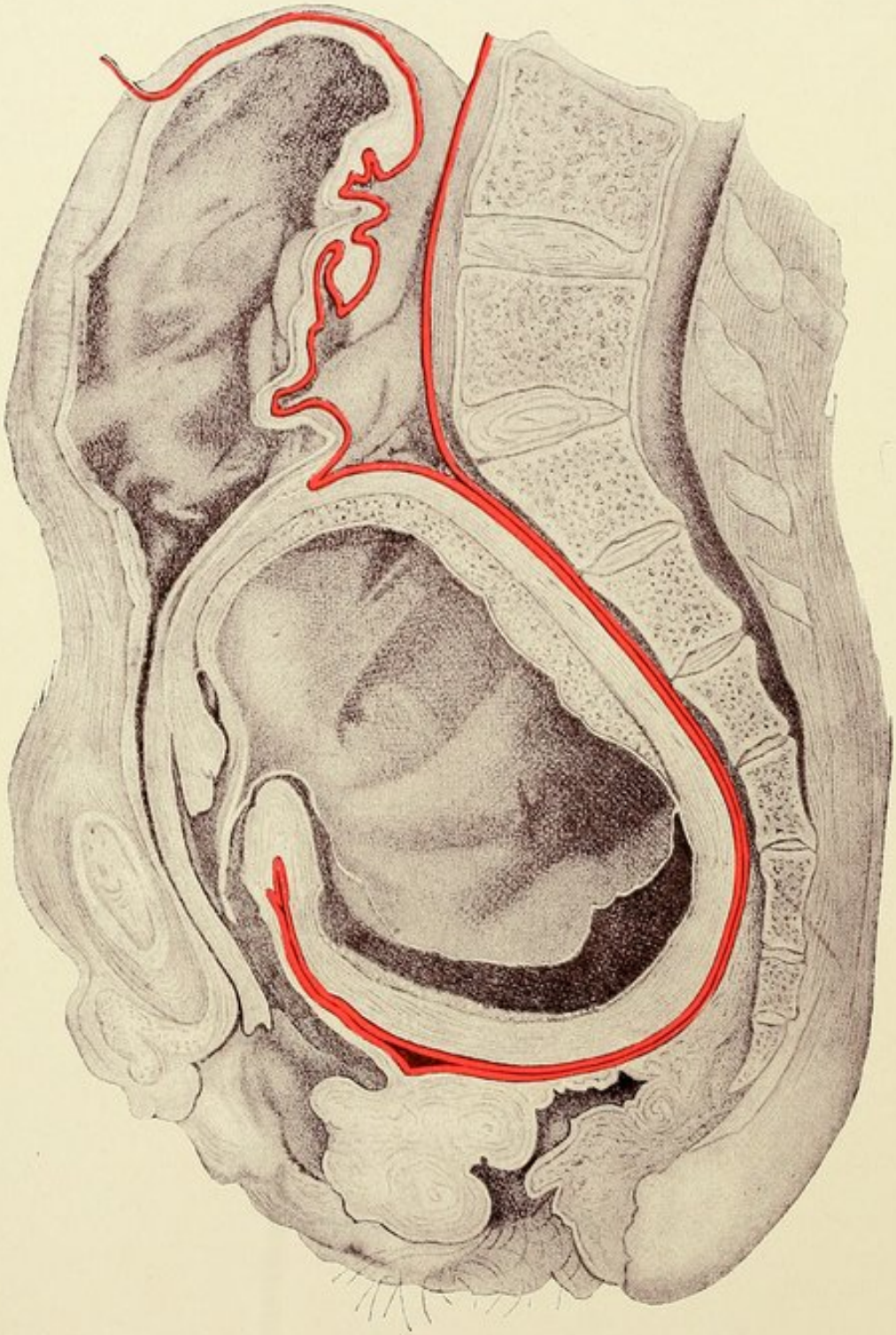
FIG. 42.



Retroverted pregnant uterus, removed because incarcerated. (GOTTSCHALK.)

are complicated by excessive nausea and vomiting, the irritation of the pelvic tissues resulting from the abnormal position of the womb being excessive. The most common displacement of the pregnant uterus is retroversion; this is most often observed in women of very deficient muscular fibre, or in women who have borne children, in whom the pelvic floor and uterine supports have been stretched or torn. Subinvolution, by increasing the weight of the uterus, helps to favor this condition; straining and lifting and the wearing of tight clothing during early pregnancy exaggerate this complication.

PLATE V.



Retroverted Pregnant Womb; Distended Bladder. Red line shows altered relation of Peritoneum. (SCHWYZER.)

The symptoms of anteflexion and anteversion of the pregnant womb are obstinate pelvic pain, with frequent micturition and nausea and vomiting. The symptoms of retroversion of the pregnant uterus are dysuria, pain in the back, dragging sensations, constipation, and pressure-pain radiating down the thighs. If the condition persists for any length of time, the pain increases in severity and fever and rapid pulse supervene. (Plate V.)

Displacements of the gravid uterus tend to spontaneous cure as pregnancy advances; thus, anteversion usually ceases spontaneously at about the fourth month of gestation. With retroversion the condition is much more serious. The uterus, tipped backward, becomes easily forced downward into the pelvic brim and even below the promontory of the sacrum. Should this condition persist adhesive inflammation follows, the uterus becomes fixed in the pelvis and is said to be incarcerated. As pregnancy advances the uterus is not enabled to increase in size proportionately with the fœtus, and early abortion is a consequence. Should the fœtus die and decomposition begin septicæmia will result, and instrumental emptying of the uterus or extirpation of this organ is imperative.

The treatment of displacements of the pregnant womb consists, first, in thoroughly emptying the intestinal tract. Obstinate constipation during pregnancy is at the same time a cause and consequence of backward displacements of the uterus. The administration of salines will usually be partially successful, and should be supplemented by injections of castor oil, 2 ounces, in one pint of warm soapsuds; this should be injected through a rectal tube and the injection allowed to pass as high as possible into the bowel, and retained as long as the patient can comfortably do so. If hardened feces are present, causing pain and distress, they can best be removed by an injection of hot soapsuds in which is dissolved an ounce of ox-gall.

The directly curative treatment of retroversion of the pregnant womb consists in replacing the uterus in its normal position and supporting it in that position until the womb has so increased in size that a return to its condition of retroversion is impossible. The attempt to replace the retroverted and pregnant uterus should not be made without an anæsthetic, if the uterus is firmly pressed down into the pelvis and if the patient is sensitive. An antiseptic injection having been given, the physician should grasp the cervix with a pair of tenaculum forceps and make gentle traction downward and backward, while with two fingers in the vagina, placed beneath the posterior wall of the uterus, he should endeavor to raise it and to throw the fundus gently forward. In some cases he may be able to exert more direct and advantageous pressure upon the uterus by the finger inserted in the rectum. While the fingers of the left hand hold the womb supported in its proper position, the right hand should insert, with dressing-forceps, an antiseptic wool tampon smeared with a suitable ointment; such wool may be rolled into a cylinder three-quarters of an inch in diameter and about two inches in length, the form of which is maintained by wrapping it with soft twine. A useful ointment in uncomplicated cases is composed as follows:

Powdered boric acid	grs. 10.
Lanolin } Cosmolin }	each ℥ ½.

This cylindrical tampon may be introduced longitudinally, the fingers of the left hand acting as a speculum, or a Sims speculum being employed if necessary. When introduced it is to be turned transversely, thus putting the utero-sacral ligaments upon the stretch, raising the fundus, and tending to throw it forward into its normal position, and drawing the cervix backward. In uncomplicated cases such a tampon may be left two or three days in position and then removed, the vagina thoroughly douched with bichloride of mercury 1 : 5000, and another tampon inserted.

In replacing the retroverted and pregnant uterus posture is often found of very great value. In simple cases, uncomplicated by adhesions, the patient may be put upon her left side, the pelvis being slightly elevated, and the pelvic floor being drawn backward and upward by a Sims speculum. The introduction of the finger will usually be followed by the raising of the uterus and its assuming the forward position, when the introduction of a soft pessary or tampon will be found a comparatively easy matter.

In cases complicated by considerable tension of the tissues in the pelvis it is best to place the patient in the knee-chest posture, when the abdominal contents gravitate forward and upward and the uterus often accompanies them when the pelvic floor is retracted. In difficult cases, where the patient suffers greatly from pain, from fright, or from reflex irritation, an anæsthetic should be employed before an attempt is made to replace the uterus. The physician should be very careful to avoid violence in these manipulations, because adhesions may be ruptured and the contents of a pyosalpinx discharged into the abdomen, or the uterus itself may be torn where its tissues have been weakened by chronic disease.

Cases of retroversion of the pregnant uterus are often complicated by inflammation of the Fallopian tubes and by adhesions binding the uterus down in its abnormal position. It is exceedingly unwise in such a case to attempt forcibly to replace the uterus; such a procedure would incur great danger of abortion or of the rupture of a pyosalpinx, and the subsequent septic infection which this would cause. In such cases the bowels should be thoroughly moved at frequent intervals by sulphate of magnesia. In selecting material for a tampon the physician will do well to choose the softest which will answer his purpose. Surgeon's lint cut into strips four inches wide and a yard long, sterilized by baking and thoroughly soaked in glycerin to which 1 per cent. of carbolic acid has been added, makes excellent material for such a tampon. It should be introduced with the aid of a Sims speculum, the posterior vaginal wall and pelvic floor being carried downward and backward. The immediate result of such an application is a very free flow of watery mucus, which tends greatly to relieve the congestion about the womb usually seen in these cases. This tampon should be removed at the end of twenty-four hours and a second inserted. It is interesting to notice, under this treatment, the gradual softening of the

adhesions and the progressive rise of the uterus out of the pelvis into the abdomen. When the tampons are changed it is well to irrigate the vagina very gently with a creolin or boric-acid solution.

To secure a good solution of boric acid the following formula will be found useful:

Acid. boric. pulv.	℥ 5½.
Glycerin	℥ 1.
Aquæ	quart 1.

To be given at a temperature of 100° F. with a fountain-syringe.

It is thought by some advantageous to employ an alterative in the ointment used upon the tampons in these cases. Ichthyol gives good results, and may be used in an ointment containing from 25 per cent. to 35 per cent. of this substance. If considerable pain, tenesmus, and sensitiveness be present, it is advantageous to combine with the ichthyol ointment belladonna, and in some cases iodoform as well.

The following formulæ have been found useful when employed with tampons in replacing the retroverted pregnant uterus:

Acid. boric. pulv.	grs. 10.
Lanolin, Ung. zinci oxidi	each ℥ ½.

Ichthyol	℥ 2.
Cosmolin, Lanolin	each ℥ ½.

Belladonna may be employed in the following prescription:

Ichthyol	℥ 2.
Extract. belladonnæ	gr. 1.
Lanolin, Cosmolin	each ℥ ½.

In cases complicated by adhesions, after the uterus has been raised to its proper position, it may be maintained by an elastic rubber pessary, either a ring or a pessary shaped like that of Hodge. So far from suitable tampons or pessaries causing abortion, they are the best preventive of such an accident when suitably fitted and gently applied. Vaginal douches in these cases should be irrigations practised very gently, the receptacle containing the antiseptic being not higher than three or four feet above the bedside of the patient.

It is a rare experience to meet with cases of retroversion in pregnancy which do not yield to the treatment just described or to some treatment conducted upon similar principles. Very firm adhesions and fresh inflammation may so bind the pregnant uterus in the pelvis in a retroverted condition that it is impossible to restore it to its normal situation. In such cases there is nothing to be gained by the use of the tampon, while the pessary is useless and may be harmful. The physician's first duty with such a patient is to secure the reposition of the uterus without regard to the interests of the embryo; while the patient is anæsthetized to surgical anæsthesia the tissues surrounding the uterus should be cautiously stretched and a very careful effort may be made to replace the womb. If only a little is gained in this

procedure, the glycerin tampon should be thoroughly packed about the uterus and the patient's bowels thoroughly moved with salines during the following twenty-four hours.

If, however, no progress is made, it is the physician's duty to empty the uterus as soon as possible; this latter procedure is often a matter of considerable difficulty in these cases. Where adhesions are present the uterus is rarely retroverted alone, but is usually retroflexed as well. As a rule, by drawing down the posterior lip of the cervix the cervix can be straightened sufficiently to permit the introduction of a small, solid dilator, or, possibly, a tupelo tent. When sufficient dilatation has been secured to permit the introduction of the finger the embryo should be shelled out of the uterus by the finger. If the finger cannot reach, then the blunt, puerperal douche-curette may be employed to advantage. The uterus should be thoroughly irrigated with 2 per cent. creolin solution at a temperature of 110° F., and packed with iodoform-gauze. If thorough antisepsis has been observed, and the procedure be conducted in a surgical manner, the patient should recover without complications.

In cases of marked retroflexion, where the uterus is bound down by adhesions, and the patient is not seen until death and decomposition of the embryo have occurred, with beginning septic infection, it is sometimes necessary to treat the uterus as if it were a malignant focus and to remove it by extirpation. Where the uterus is not too large, vaginal extirpation with the use of clamps or ligatures is preferable in such a case. Where this is impossible abdominal section and the ligation of the broad ligaments and removal of the uterus are indicated.

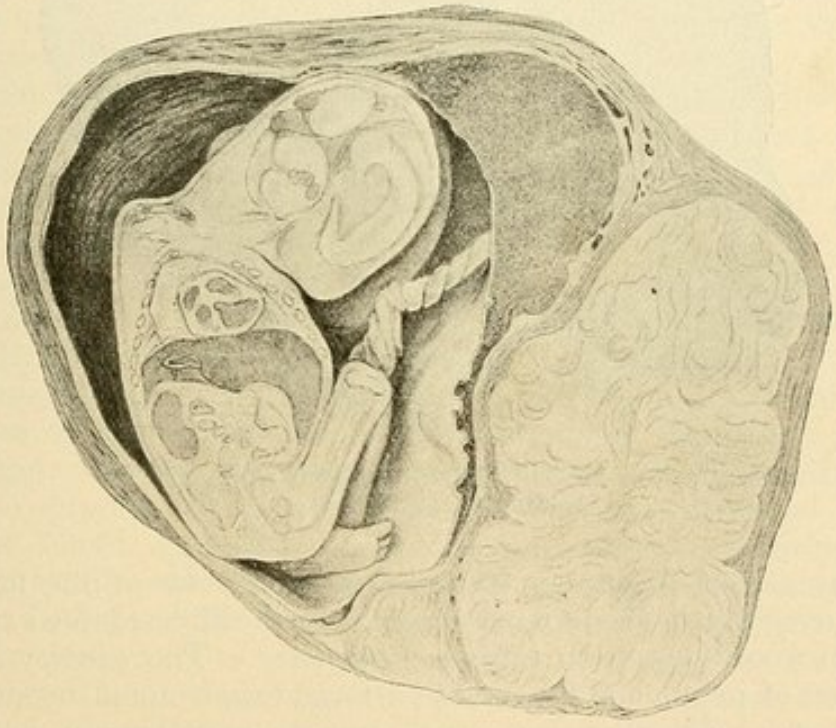
In cases in which the uterus is anteflexed or anteverted and forced strongly down into the pelvis it should be restored to its former position in the same manner described in treating of retro-displacements. Under surgical anæsthesia the genital tract should be thoroughly irrigated with an antiseptic and a gentle and patient effort be made to carry the womb upward and backward above the brim of the pelvis; this is best accomplished with the fingers. In these cases the physician may be satisfied with what appears a very slight change in the position of the uterus, for experience shows that the reflex irritation proceeding from the impacted condition of the uterus is relieved if only it be dislodged slightly from its position. In these cases the glycerin tampon may be used if it is desired to accomplish local depletion of serum, while if this is not necessary, packing with antiseptic wool will be found efficacious. Constipation is to be carefully avoided in these cases, as the straining which occurs in attempts at defecation greatly favors the return of the malposition of the uterus.

To replace and retain an anteverted uterus, the soft wool pessary will be found of great value, made into the shape of a magnet or horseshoe. The curve of the pessary should be directed posteriorly, the two ends of the pessary being placed on each side of the urethra and just behind the pubes. In this manner the bladder will not be interfered with, while the uterus will be raised from the pelvis and carried upward above the brim. Such a pessary should not be long enough to extend beyond the median line of the pelvis, as pressure in that position would tend to aggravate the anteversion.

If a pregnant patient be found with the pelvic floor so lacerated that the supports of the uterus have been largely destroyed, great difficulty may be experienced in supporting the womb in a favorable position. The natural suggestion would be to restore the pelvic floor by a plastic operation; should this seem absolutely necessary it does not at all follow that pregnancy would be interrupted by such a procedure. If the patient is in poor general condition by reason of her pregnancy, it is quite possible that an unsatisfactory union may follow such an operation; if, however, she is in good general condition, the operation may be performed if clearly required. Amputation of the cervix or closure of a torn cervix has been done during pregnancy without interrupting gestation. If the genital tract be thoroughly cleansed before the operation, and antiseptic precautions be observed, good union is usually procured.

Myomata of the uterus, often known as uterine fibroids, will rarely of themselves interrupt pregnancy, but are often accompanied by conditions which cause abortion. It is not uncommon to find endometritis and salpingitis complicating myomata of the uterus, and abortion

FIG. 43.



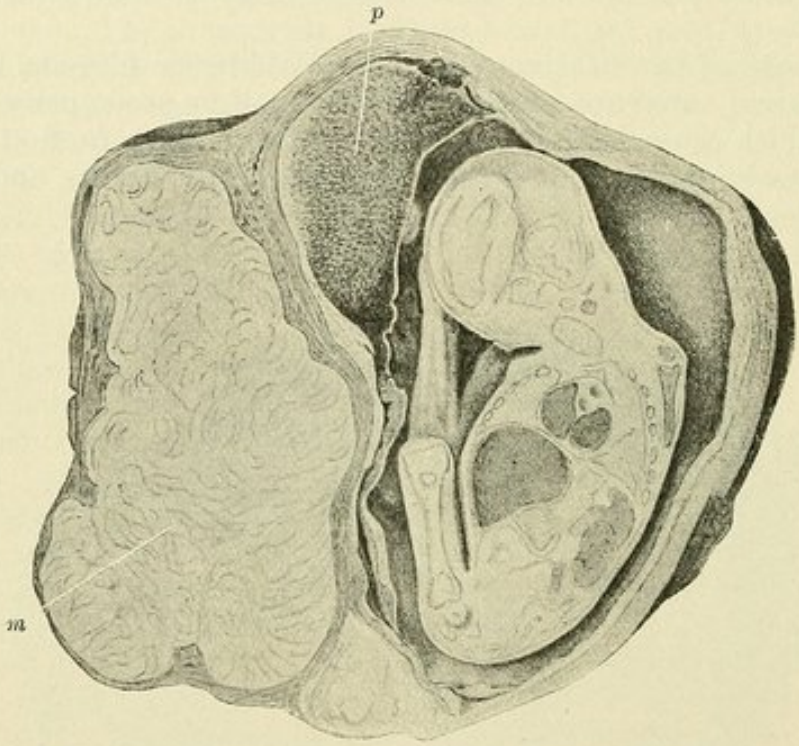
Section through pregnant fibroid uterus and fœtus. (GÖRDES.)

occurring in such cases must be ascribed to these conditions, except in those rare instances in which the fibroid uterus becomes impacted in the pelvis, and abortion results from the impaction of the growing womb. Pregnant patients who have fibroids often complain of pain during pregnancy, resulting from the exaggerated rhythmical contractions of the uterus. During early pregnancy a fibroid uterus often

presses upon the bladder and rectum, causing great inconvenience. Pregnancy causes these tumors to increase in size very rapidly, and often brings about softening and fatty degeneration. The uterus may be so altered in consistence that spontaneous rupture occurs. When the fibroid uterus becomes wedged in the pelvis rhythmical uterine contractions may dislodge the organ and also bring about rupture of the membranes and abortion.

The diagnosis of fibroids of the uterus complicating pregnancy is made by palpation and vaginal examination, and also by the presence or absence of uterine pains and of pressure-symptoms, and œdema of the legs.

FIG. 44.



Section through pregnant fibroid uterus and fœtus. (GÖRDES.)
m. Myoma. *p*. Placenta.

The treatment of pregnancy complicated by fibroids of the uterus is a surgical one only. There is no form of medication adapted to these cases which would not terminate the pregnancy. The gravity of this complication of pregnancy depends to a large extent upon the situation of the myoma. If submucous, such tumors may become pedunculated, and, entering the lower uterine segment, may present before the fœtus, exciting premature labor. During the progress of labor the fœtus and the tumor will pass each other by uterine contractions in a remarkable manner, spontaneous delivery often occurring where at first no possibility of such a result was recognized. During labor such a tumor often presents before the child; its removal during parturition is often possible. Intramural tumors may not be diagnosticated during pregnancy, and require no treatment unless they so enlarge the womb as to cause pressure-symptoms. When this is the case, abortion or

premature labor usually follows; and should interference be demanded the extirpation of the uterus is indicated.

Subserous fibroids are most favorable for treatment during the pregnant condition. Myomectomy has been repeatedly performed upon the pregnant uterus, and with excellent results. The method of operating is by abdominal section, by splitting the capsule of the tumor and shelling it out. The cavity which the removal of the tumor leaves is usually closed by silk or catgut ligatures. Under antiseptic precautions drainage is unnecessary, and the results of the operation are usually excellent. The diagnosis of subserous myomata complicating pregnancy often presents no especial difficulties when the tumor is upon the anterior wall of the uterus. In such cases careful palpation will usually recognize the existence of the tumor.

Spontaneous abortion occurring in cases of myomata complicating pregnancy may necessitate abdominal section and extirpation of the uterus, should septic infection follow the abortion. In these cases the entire removal of the diseased tissue is imperative. If rapid operation is desired, and the cervix is not implicated in fibroid disease, the uterus, tubes, and ovaries may be drawn up out of the abdomen, a wire loop placed about the cervix, and the uterus amputated at this point, leaving the stump in the lower angle of the abdominal incision. The complete extirpation of the uterus is desirable, however, in these cases, and can usually be accomplished.

The majority of cases of pregnancy complicated by fibroid or myomatous growths of the uterus pass through pregnancy without interruption. In 796 cases it was found that abortion occurred in about $6\frac{2}{10}$ per cent. The mortality of these cases since the practice of antiseptic surgery has become common varies from 24 per cent. to 11 per cent., including cases subjected to operation. In dealing with these patients the physician must remember that myomatous tumors of the uterus grow with great rapidity under the stimulus of pregnancy, and that a radical interference may be required early in pregnancy for this reason.

Cancer of the uterus, like myomatous tumors, increases in size with great rapidity during the pregnant state. As soon as a diagnosis is made the question of operation must be seriously discussed. If the cancer be found upon the cervix, the immediate amputation of the latter is the duty of the physician. In cases in which the cancer has spread at all beyond the cervix the extirpation of the pregnant uterus should be performed as soon as possible. In cases seen late in pregnancy, where the cervix and lower portion of the uterus are extensively involved, it is sometimes advisable to allow the pregnancy to go on as nearly to term as possible in the interests of the child, Cæsarean section being chosen to secure a living child, followed immediately by extirpation of the cancerous uterus. The prognosis in these cases is exceedingly bad for the mother, as septic infection is almost inevitable if the uterus be left after Cæsarean section. In the early months of gestation extirpation should be practised *per vaginam*, but as the size of the womb increases the operator will be obliged to perform abdominal section in order to effect his purpose.

The womb, the seat of malignant disease, may be torn apart by its

own contractions. This may occur early during pregnancy or during labor at term. The prognosis in these cases is very grave, as suture of the uterus cannot be performed, and extirpation is the only resource. Where the cervix only is involved temporary check seems to be given to the disease if the cancerous tissue is thoroughly removed by the knife and cautery. When the patient is seen at the fourth or fifth month the physician may think best to gain time for the development of the fœtus to viability by removing the diseased cervix and allowing the pregnancy to continue. Cancer of the decidua is occasionally observed during pregnancy, and causes a symmetrical and rapid enlargement of the uterus. A foul discharge and hemorrhage usually are present in these cases. Gestation rarely proceeds to term, and the prognosis is distinctly unfavorable unless early extirpation is practised.

Epithelioma of the cervix, when complicating pregnancy, may become sufficiently bulky to impede the delivery of the child. When these cases are seen sufficiently early prompt amputation of the cervix need not interfere with the pregnancy, and may prevent the rapid extension of the growth. The use of the cautery is much more apt to be followed by abortion than is amputation by the knife.

Sarcoma of the decidual lining of the uterus is occasionally observed and often persists after delivery. Its symptoms are foul discharge and hemorrhage after the puerperal period, with progressive increase in the size of the uterus. The diagnosis of malignancy in these cases can only be made by observing them for a considerable period and by the persistence of the symptoms in spite of curetting and tamponing.

The decidual lining of the uterus may be the seat of non-malignant hypertrophy, in which the decidual cells become large in size and with large nuclei containing leucocytes, and without intercellular substance. Subinvolution often follows this condition, usually requiring the free use of the curette.

Among the pathological conditions of the uterus not infrequently observed, and often resulting in the interruption of pregnancy, endometritis is the most common. It is almost invariably infectious in origin, usually from gonorrhœal or septic germs. The symptoms of this condition during pregnancy are intermittent metrorrhagia or mucoid watery discharges, sometimes of muco-purulent fluid. One of the results of this condition is the adherence of the membranes about the internal *os uteri*, sometimes delaying the dilatation of the os and cervix. The membranes usually rupture prematurely in these cases, and protracted and difficult labor may result. Adhesion of the placenta is the usual consequence of endometritis during pregnancy, and the dangers of this condition must be expected when such a complication is present. In women who conceive frequently, and who have several abortions in succession, endometritis is present, even though the precise cause of infection cannot be recognized.

The treatment of endometritis complicating pregnancy consists in attention to the general health of the mother, with careful observation of the character and quantity of any discharge from the uterus. When a bloody or watery discharge has persisted for some time it is highly probable that the life of the ovum has already been sacrificed. If the

patient is not in circumstances where she can have good care and be under faithful observation, it is better to terminate the pregnancy as soon as possible. This should be done by dilating the mouth of the uterus, removing the ovum with the finger, if possible, and thoroughly curetting and douching the uterus. With proper antiseptic precautions this procedure is not attended with great danger. If the physician is called to the patient during abortion, and the history points to chronic endometritis, he will find the abortion a good occasion for curetting, followed by drainage with iodoform-gauze. Many cases of habitual abortion depend upon chronic endometritis for their causation, and such are frequently cured by the curette and drainage.

A not infrequent complication of pregnancy is found in **salpingitis**, usually chronic, occasionally acute. This condition is usually associated with pelvic peritonitis and adhesions of the pelvic viscera, and sometimes with prolonged anorexia and emesis. The patient's usual complaint is that of pain, tearing or cutting in character, felt at irregular intervals, and caused by the gradual increase in size of the uterus and by the stretching of the adhesions by the growing womb. The uterus is often found in an abnormal position, and abnormally flexed. In some cases a tumor can be recognized at the side of the uterus; in other cases no appreciable enlargement is detected. Close questioning of the patient will often afford the history of alcoholism or of previous infection, usually gonorrhœal in character.

In considering the treatment of salpingitis during pregnancy it is most important to recognize the presence or absence of pelvic peritonitis and cellulitis. If these be present and the uterus firmly adherent, the prognosis for the continuance of pregnancy is poor. The obstetrician's first duty being to the mother, as soon as an accurate diagnosis is made an endeavor should be begun to raise the uterus and gradually to stretch the adhesions which bind it down. The treatment already described for pelvic adhesions is indicated, with free saline purgatives, rest in bed, and counter-irritation. The avoidance, as far as possible, of straining and lifting is also indicated.

Pyosalpinx complicating pregnancy may become a source of positive danger to the patient through threatened rupture and septic infection. As has been said, abortion is very likely to occur in cases in which the tubes and ovaries are extensively diseased, and hence there should be no hesitation in treating such complications radically if they assume serious proportions. It is possible to perform abdominal section and to remove a tube and ovary without interrupting the pregnancy. An especial reason for the radical treatment of these conditions during pregnancy is found in the danger resulting from them during and after labor. Rupture of a tubal abscess may occur during labor, or a salpingitis may be increased in severity. Cases have been observed in which a patient went through pregnancy and labor apparently without complications only to be fatally infected, when convalescent from labor, by the rupture of a small tubal abscess and the escape of its fluid into the general peritoneal tract. Retroversion and retroflexion of the pregnant uterus are frequently found, caused by pelvic adhesions.

Inflammatory disease of the tubes, ovaries, or pelvic peritoneum is a

distinct contraindication of pregnancy, and patients suffering in this way should have the pelvic disorder cured before conception can possibly occur.

Ovarian disorders during gestation are not infrequently observed. Salpingitis and pelvic peritonitis are usually accompanied by oöphoritis, chronic in character. Tumors of the ovary are not infrequently seen in the pregnant patient, and often require treatment; when their size becomes considerable they furnish a serious complication in labor and necessitate surgical treatment.

Ovarian tumors are peculiarly liable to twisting of the pedicle during pregnancy, occasioning a most serious complication of gestation. Cystic tumors of the ovary often increase with great rapidity, and may disguise early pregnancy and render a diagnosis difficult. Such cases require careful examination for accurate diagnosis, and a conclusion is often reached with great difficulty.

At the present stage of surgical science the question of the treatment of tumors of the ovary complicating pregnancy admits of far less doubt and discussion than formerly. The reasons previously urged for non-interference were based upon the dangers of ovariotomy and a belief that such a procedure must interrupt pregnancy. While the removal of such a growth is attended with risk both as regards recovery of the patient and the continuance of the pregnancy, still in competent hands this risk is so slight and is so far outweighed by the danger incurred in allowing the growth to remain, that interference must be considered the duty of the physician. Puncture of ovarian cysts during pregnancy cannot be advised on account of the dangers of septic infection and shock which accompany this procedure.

Spontaneous cure of pelvic cysts complicating pregnancy is occasionally observed. Such cysts, however, are not of the ovary, but are broad-ligament cysts containing a clear and limpid fluid, which is readily absorbed. A blow or fall upon the abdomen of such a patient may rupture the cyst, its contents undergoing rapid absorption.

Spontaneous rupture of the uterus during pregnancy occasionally happens in cases complicated by fibroid tumor or by displacement of the uterus bound down by adhesions. The risk of this accident must always be borne in mind in attempting to replace a uterus so adherent and bound down. Rupture may happen several days after the attempt to replace the uterus has been made, and in these cases the accident is to be ascribed more to contractions of the diseased uterus than to the manipulation directly practised to replace it in its normal position. Cases have been noted in which the rupture occurred transversely, the tissues stretching from one Fallopian tube to the other. Spontaneous rupture of the pregnant uterus may follow the rapid development of a large fœtus in a uterus whose walls have been thinned by repeated parturition or by previous disease. Fatty degeneration of the uterine wall is usually found in these cases, the fœtus escaping into the abdominal cavity. Unless subjected to immediate operation such rupture is almost invariably fatal, the patient perishing from peritonitis.

Disorders of the vulva occurring in pregnancy may be the result of mechanical injury, of infection, or may be associated with some

constitutional condition. The congested condition of the vulva favors the occurrence of hæmatoma in cases of contusion. While the absorption of the extravasated blood goes on slowly under pressure, still the more satisfactory method of treatment is incision, under antiseptic precautions, with the use of the antiseptic tampon. Should the tissues be torn through by direct violence, severe and even fatal hemorrhage may result. In these cases no one vessel will be found to ligate, and the hemorrhage can be stopped either by passing a ligature deeply beneath a mass of tissue or by applying a firm antiseptic compress. The use of styptics is contraindicated through the danger of embolism or thrombosis which accompanies their employment.

Among the most common disorders of the vulva occurring during pregnancy is pruritus. This varies in degree from annoying itching, which is relieved by a simple lotion, to a severe and persistent burning sensation which may deprive the patient of sleep and seriously reduce her strength. Where cleanliness is scrupulously practised, and pruritus still continues, a cause must be sought for it in either a constitutional condition or in a local disorder. A thorough examination should be made of the patient to determine whether she is suffering from some profound disorder of the digestive and excretory systems, such as diabetes or nephritis. In some patients lithæmia or gout is found to be present in these cases. Where diabetes is diagnosticated the appropriate treatment for this disorder often results in greatly allaying the local suffering.

In cases of obstinate pruritus an examination of the urine will often assist greatly in arriving at a diagnosis. Sugar and acetone are the substances most frequently found in these cases. The tests for the former usually employed may be used, attention being called to the fermentation-test, which is used as follows: Four ounces of the suspected urine are put in a twelve-ounce bottle, to which is added a piece of compressed yeast the size of a small walnut. A cork with a small nick in it is employed to close the bottle, and to permit the escape of carbonic-acid gas. A tightly corked four-ounce bottle filled with the same urine, but without yeast, is placed beside the first, and both are allowed to remain in a warm place for from eighteen to twenty-four hours. Fermentation will then be complete, and the urine will have become clear. The specific gravity of the fermented urine is compared with that of the unfermented, and the percentage of sugar present estimated by multiplying the number of degrees of specific gravity lost by the fraction $\frac{23}{100}$. Attention is also called to the bismuth-test, which depends for its efficiency upon the fact that sugar possesses the power of reducing the salts of bismuth, and, if present, that black metallic bismuth will be deposited. Tests by picric acid and by phenyl-hydrazin are both used for small amounts of sugar.

For acetone the suspected urine is first made alkaline by *liquor potassæ*. A few drops of fresh, strong solution of sodium nitro-prusside are then added, when a distinct red color is developed. This red color gradually disappears; but if acetone be present, a few drops of concentrated acid brings out a purple or violet-red. If acetone is absent, this change does not occur.

It is often possible to modify the composition of the urine sufficiently to reduce or entirely obviate the irritation which it causes upon the tissues affected by pruritus. The urine may be diluted by causing the patient to drink freely of water, and especially of faintly alkaline water. The administration of dilute acids in the form of lemonade is also indicated in many cases. The administration of boracic acid may be conveniently accomplished by the use of disks of rice-flour, known as wafers or conseals. Five or ten grains of boracic acid may be given in this way conveniently. In some cases the administration of dilute hydrochloric acid at mealtime will result in a better digestion and diminish the quantity of irritating material which the urine contains. Where the urine gives evidence that catarrh of the bladder or cystitis is present, the bladder should be thoroughly irrigated once daily with creolin, ½ per cent., or with a solution of sodium biborate, ten grains to the ounce. The avoidance of spices and condiments in the diet is also a useful precaution if the orifice of the urethra and vaginal tissues is very much inflamed. In other cases tonics are indicated to improve the general health. The following formulæ have been found useful by Stelwagon in the treatment of this condition :

Acid. carbolici	ʒj–ʒiij.
Glycerin	ʒij.
Alcohol	ʒj.
Aquæ q. s. ad	Oj.

Same as above, with one to three drachms of resorcin added or replacing the carbolic acid.

Liquor carbonis detergens, of varying strength, from one to two teaspoonfuls in a teacupful of water up to the pure solution.

Menthol, five to ten grains to the ounce of liquid petrolatum or cold cream.

Thymol, five to ten grains to the ounce of liquid petrolatum or cold cream.

Cocaine, one to ten grains, in solution or ointment.

A half to one drachm each of camphor and chloral to the ounce of ointment.

Hot-water sponging or steaming as a temporary measure of relief.

In cases due to irritating discharges, astringent applications and injections of alum, tannic acid, zinc sulphate; also hot-water injections.

Where no general cause can be ascertained for the disorder various antiseptics and anæsthetic applications are indicated. Such are carbolic acid, nitrate of silver, alkaline douches, starch poultices, laudanum and lead-water, the application of the galvanic current, and sitz-baths of varying degrees of heat or cold. A complete cure must not be expected in an obstinate case of this sort, and the most that can be done is to palliate until the termination of pregnancy shall remove the cause. In cases in which pruritus persists after the termination of pregnancy resection of the diseased tissue is often indicated. This may be carried to the extent of partial or total extirpation of the vulva, including the greater portion of the clitoris. A plastic

operation will be found necessary to cover surfaces exposed in the extirpation.

The vulva may be the seat of **elephantiasis** during gestation, which may occasion an obstruction to the delivery of the child. While syphilis is often present in patients suffering from this disorder, still such is not invariably the case, and the presence of elephantiasis should not lead to the assertion that the patient is syphilitic. In the absence of other signs of syphilis the local condition does not prove specific infection. In some cases of elephantiasis the hypertrophied tissue increases very considerably during pregnancy and undergoes a partial decrease during the puerperal period. In other cases no appreciable difference in size can be detected at various periods before and after labor.

Diseased conditions of the vagina occasionally complicate pregnancy, notably polypoid degeneration, which greatly thickens the vaginal wall, and may attain such proportions as to form an obstacle to delivery. Chronic gonorrhœal inflammation of the vagina sometimes results in altered conditions of the mucous membrane and connective tissue.

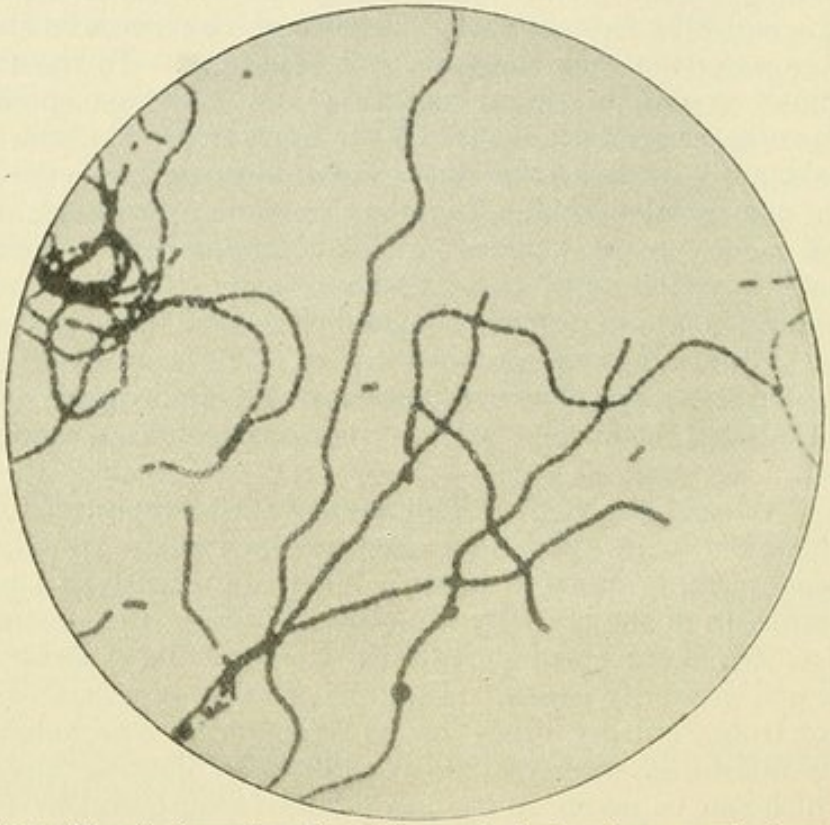
Varicose veins of the vagina often assume such proportions that they may be mistaken by inexperienced observers for foreign growths. They may occasion complications at labor. They are often found associated with constriction of the body by improper clothing, with obstinate constipation, or displacements of the uterus. If these conditions be removed, their size will generally lessen. Rupture of these veins may arise from violence or from a cutting injury during pregnancy. The hemorrhage is frequently alarming, and is to be controlled by ligating any bleeding points which can be taken up by hæmostatic forceps, and by the application of a tampon of iodoform-gauze under antiseptic precautions. Great difficulty is usually experienced in ligating these veins. The attempt to pass a needle beneath them exposes them to danger of puncture, and the tampon is usually the quickest and most efficient method of stopping the bleeding. Preparations of iron should never be employed as applications in these cases. Glycerite of tannin is a useful application when employed upon tampon-material.

The genital tract of the healthy pregnant patient contains normally no *pathogenic bacteria*. While micro-organisms are present in the vagina, they are not pathogenic and are not endowed with poisonous activity. The presence of streptococci not in an active state has been established by some and denied by others. The facts, so far as ascertained, point to the conclusion that certainly no actively pathogenic germs are found in the genital canal of the normal pregnant patient. When, however, the resisting power of the tissues is impaired by prolonged mechanical injury, by exhausting disease, or by pathogenic lesions of the mucous membrane, micro-organisms ordinarily not pathogenic may become so and occasion septic infection.

Investigation has shown that the augmented secretion of the vagina during pregnancy, usually of a distinctly acid reaction, is an efficient germicide. Cultures of septic bacteria introduced within the vagina of a healthy patient are destroyed by this secretion. Any pathological process which alters its acid reaction destroys also its antiseptic

power and renders it useless in the destruction of germs. The practical inference from this observation is found in the fact that healthy patients need no douches before labor, while those in whom

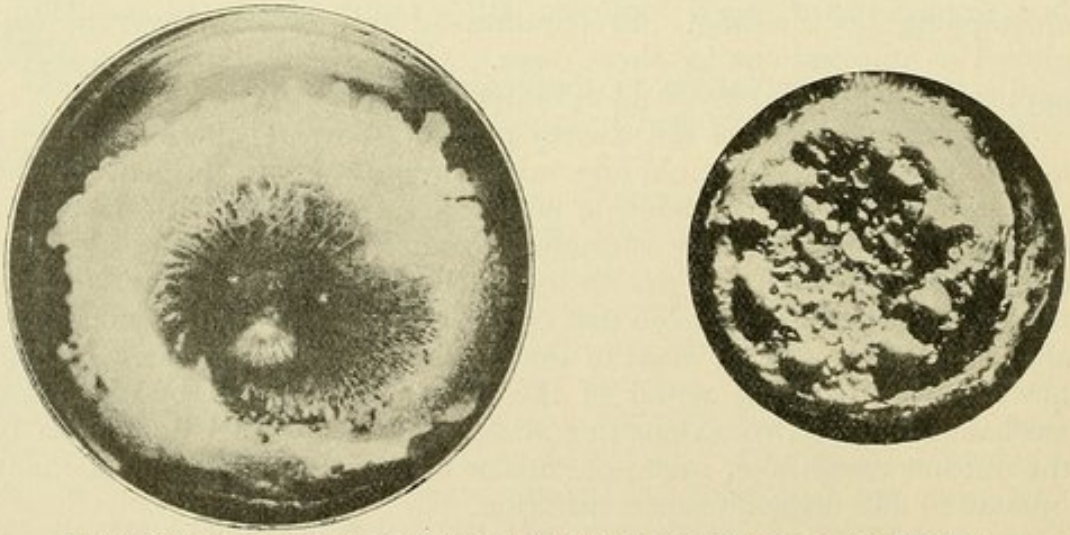
FIG. 45.



Bacteria from acid vaginal secretion of a multipara who had not been examined per vaginam. (WALTHARD.)

FIG. 46.

FIG. 47.

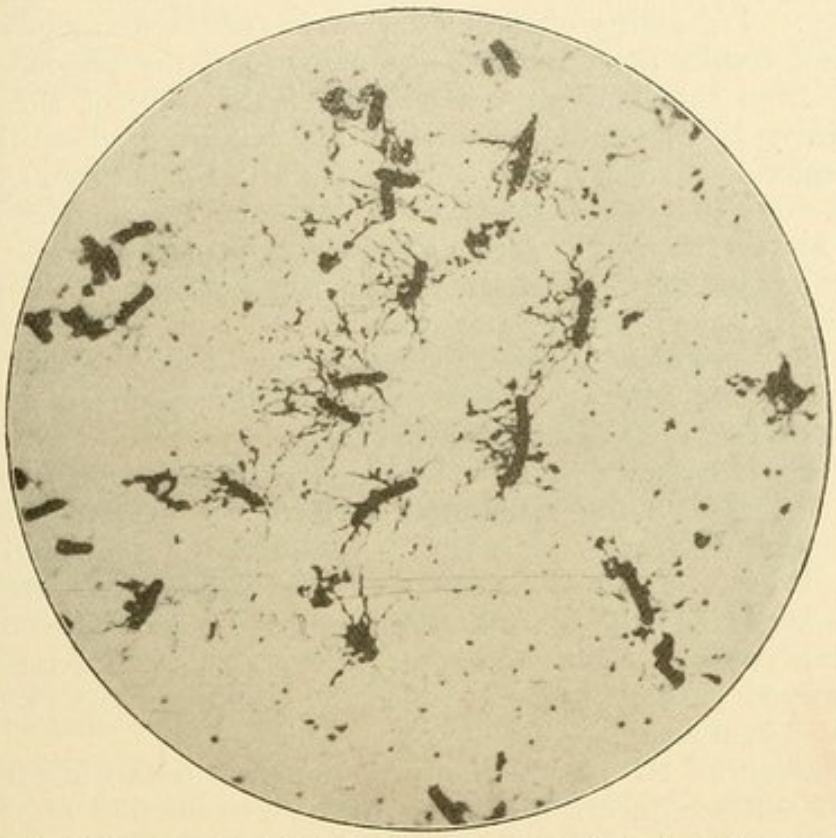


Cultures, twenty-four hours, on potato and agar from preceding case. (WALTHARD.)

a pathological process has produced an abnormal vaginal secretion require vaginal douching sufficiently often to thoroughly remove disease-secretions, and, if possible, to bring about a healthy condition of

the parts. Attention should be called to the fact that the albuminoid material in mucus and pus becomes an insoluble compound under the influence of a mercurial solution, and that hence bichloride douches are of inferior value in cleansing the vagina and in removing such secretions. The best preliminary douche for removing pus and mucus from the vagina is soap and water, and green soap in the form of tincture or a watery mixture is especially useful. Combinations of soap with carbolic acid, or one of its derivatives, are also of value for this purpose.

FIG. 48.



Moving bacteria from acid vaginal secretion of a woman who had not been examined. (WALTHARD.)

When the mucous membrane has been thoroughly cleansed from these abnormal secretions, bichloride solutions will then be found efficient in destroying poisonous bacteria. If, however, but a single douche is desired, then the combination of a carbolic substance with soap gives the best practical results.

The most frequent pathogenic germ which may be found in the pregnant patient is that of gonorrhœa. Gonorrhœal vaginitis does not differ ordinarily in the pregnant from this disorder when observed in the non-pregnant. The congested condition of the parts favors infiltration of the submucous tissues, and extensive inflammation and abscess are likely to occur. The extension of the gonorrhœal process within the cervix results in adhesive inflammation between the membranes and the tissues at the internal os. This may occasion delay in dilatation at labor and further premature rupture of the membranes. The urethra and bladder are commonly invaded in the pregnant patient

by the gonorrhœal poison as in the non-pregnant. Infection of the urinary tract is more dangerous in the pregnant than in the non-pregnant, for, after labor, an extension of the process along the ureters to the kidney is not infrequently observed. The hypertrophic condition of the pelvic tissues furthers the extension of infection and increases the danger which pregnant patients experience from such a complication. The treatment of gonorrhœa occurring during pregnancy will be considered under the *prophylaxis of specific infection.*

The urethra, bladder, and ureters are the seat of the same congestion and hypertrophy which are observed in the genital tract during pregnancy. Irritability of the bladder is one of the first signs of pregnancy, and results not only from the pressure of the pregnant uterus, but also from the increased vascularity of the neck of the bladder. During early pregnancy the bladder is less capable of distention in its antero-posterior diameter, and hence is enlarged laterally as gestation proceeds. As the uterus rises in the abdomen the bladder is drawn with it above the pelvic brim, thus being protected from pressure against the bones of the pelvis. In the displacements of the pregnant uterus the bladder often accompanies the uterus in its abnormal position. Simple vesical catarrh is often observed in pregnant women after exposure to cold or in those who are suffering from a catarrhal condition of the intestine or bronchial tubes.

The urethra becomes greatly thickened as pregnancy advances and the bladder rises in the abdominal cavity. In displacements of the pregnant uterus partial or complete occlusion of the urethra may occur, and, following this, distention of the bladder and paralysis of its muscular layer; the urine remaining in the bladder becomes alkaline, and necrosis of tissue and rupture may result. A fatal issue has been observed in such a case in which the interior of the bladder had largely sloughed away.

The pressure of the pregnant womb upon the ureters at the brim of the pelvis not infrequently causes obstruction to the flow of urine into the bladder, with resulting distention of the pelvis of the kidney and of the ureters. If, however, this condition be but partial, no especial harm results, provided the excretions of the patient are carefully guarded. That distention of the ureters and pelves of the kidneys favors kidney-failure and uræmic poisoning there can be no doubt.

While the condition of the kidneys during pregnancy does not, in healthy women, become pathological, it is still so close to the borderline between health and disease, and its condition so frequently becomes pathological, that it may well be treated of under the head of the pathology of pregnancy. The term "engorgement" has been used to designate the kidney of pregnancy, and represents fairly the condition of these organs. Examination of the kidneys of pregnant women has demonstrated the presence of hyaline casts, with urinary salts in deposit and epithelial débris in the renal tubules. Beginning fatty degeneration is sometimes observed in various portions of the kidneys. Infection is, however, absent in the kidney of pregnancy, granular degeneration of the epithelium is wanting, granular, epithelial, bloody and fat-casts are absent from the tubules—in other words, nephritis is not

present. The condition of pregnancy does not cause nephritis, but only predisposition to it by the engorgement of the kidneys which it occasions. So long as the systematic examination of the urine shows a fair percentage of urea and solids excreted, serum-albumin, if present, found in moderate amount only, hyaline casts only present, and epithelial, granular, blood, and fat-casts absent, nephritis cannot be diagnosticated, and the condition of the kidney is best described by the term "kidney of pregnancy."

The presence of serum-albumin only in the urine of pregnant patients is of little pathological significance. Many who have made investigations regarding the frequency of albuminuria in pregnancy find serum-albumin in 5 per cent. of patients during gestation. This proportion increases until during the last four weeks of gestation, when 71 per cent. of patients show serum-albumin in the kidney excretion. In but 2 per cent. of these cases were casts present. In 8 per cent. of these patients labor was premature, while in $21\frac{5}{10}$ per cent. of those who had casts in the urine pregnancy ended before its normal termination. Others have found serum-albumin so frequently in the urine of pregnant patients that it is thought the invariable result of gestation and to be included in the signs of the gravid condition.

Among the most interesting pathological conditions of pregnancy is that of what is known as sudden kidney-failure. Its symptoms are those of uræmia, and it is characterized by rapid lessening in quantity, sudden deficiency in the amount of urea excreted, with rapid development of uræmic coma, speedily becoming fatal. Such a patient may have the epileptiform spasms of uræmia. Casts may be found in abundance in the urine of such patients, usually hyaline or epithelial in character. Prompt and thorough treatment, addressed to the re-establishment of the excretion of solids and the relief of the congested condition of the kidneys, is often followed by speedy recovery. Such patients do not necessarily become nephritic after recovering from pregnancy.

Interstitial nephritis occurring during pregnancy is accompanied by or causes the same symptoms which this condition produces in the non-pregnant. The diagnosis is to be established by the examination of the urine, in which albumin and casts are abundantly present. The progress of interstitial nephritis is hastened by the pregnant condition, with the added unfavorable element that the patient rarely recovers from nephritis, even if she escapes eclampsia and passes successfully through her pregnancy. Those who have investigated the prognosis of nephritis during pregnancy find that in seventy-seven patients $6\frac{5}{10}$ per cent. of them suffered from chronic nephritis after labor. The comparative proportion of patients who contracted chronic nephritis after pregnancy is shown in the statement that of the entire series of cases upward of 60 per cent. who had pathological constituents in the urine during pregnancy were free from this condition after their recovery from labor. 16 per cent. showed slightly damaged kidneys persisting after recovery from gestation, while 15 per cent. of these patients suffered from catarrh of the urinary tract following labor. In view of the unfavorable prognosis as regards the persistence of a pathological condition of the kidneys, physicians should remember to

warn patients who have damaged kidney against incurring the danger which pregnancy brings. Such patients should not marry, and especially in married women who have during one pregnancy suffered from this complication another pregnancy should not occur.

Of all symptoms indicating a dangerous condition during pregnancy by reason of kidney-failure, albuminuric retinitis may be accounted the most significant. Disturbances of vision occurring during the first six months of pregnancy and associated with violent headache are the usual symptoms of this complication. The termination of pregnancy is the plain duty of the physician under these circumstances, and this without delay. Where disturbances of sight occur during the last six or seven weeks of gestation the danger is less threatening, although even then considerable. It is possible for a patient suffering from such involvement of the retina during one pregnancy to escape during a subsequent gestation, and especially if she be the subject of care addressed to stimulating the excretory processes.

The excretion of sugar by the kidneys during gestation has been investigated by various observers, with the result that milk-sugar is found in traces when the secretion of milk becomes thoroughly established. In some cases it is present before milk is fully formed in the breasts. Sugar and acetone, however, are not normally present in the urine during pregnancy, and when observed their presence should lead to a careful investigation to determine the presence or absence of toxæmia.

Affections of the urinary tract occurring during pregnancy are to be diagnosticated and treated as in the non-pregnant. The danger, however, to the patient is greater in these cases than when gestation is not present, by reason of the condition of the urinary organs which is distinctly favorable to serious disease, and also by reason of the fact that infection of this portion of the body may so readily occur at labor and result fatally. Modern methods of diagnosis, including the visual examination of the interior of the bladder and the catheterization of the ureters, enable the physician to recognize a condition of disease far more readily than heretofore and to apply his treatment more directly and successfully.

Diseases and affections of the peritoneum occurring during pregnancy. The peritoneum of a pregnant patient may be affected by the same disorders experienced by the non-pregnant. The remarkable development of the peritoneal covering of the uterus and the free communication between the lymphatics of the genital tract and those of the uterus render the peritoneum during pregnancy more susceptible to injury or infection. The history of the patient before pregnancy may disclose the fact that infection had already occurred, and that she still retains infective bacteria in some portions of the pelvic organs readily communicating with the peritoneum. In these cases the disturbances caused by labor may be sufficient to liberate septic germs, resulting in reinfection, with serious consequences. Cases of old tubal disease with tubal or ovarian abscess are those most dangerous on account of possible infection of the peritoneum in subsequent pregnancy. Occasionally general peritonitis in the pregnant patient follows exposure to cold

without a source of direct infection which can be discovered. A severe strain or fall may cause rapidly developing peritonitis during gestation. This may occur independently of rupture of any part of the genital tract. The occasional presence of hydatids, causing suppuration within the peritoneal cavity, must be remembered in diagnosticating this condition.

Masked bleeding threatens mother and child with great peril during gestation. This may follow the partial separation of the placenta, if the pregnancy is intrauterine, or when the pregnancy is also extrauterine and of the abdominal variety. Such hemorrhage may also result from ruptured veins in the broad ligaments; from a rupture of a pregnant Fallopian tube and the escape of the ovum into the peritoneal cavity, and from the rupture of the Fallopian tube containing an impregnated ovum and the escape of the ovum between the folds of the broad ligament. Occasionally this dangerous complication is rendered more obscure by the occurrence of twin-pregnancy, one ovum being situated within the uterus and the other without the womb.

Whether the pregnancy be intrauterine or extrauterine, the symptoms of concealed hemorrhage, upon which reliance should be placed for diagnosis, are those symptoms which attract the attention of the intelligent surgeon after any surgical procedure, namely, the signs of shock. If the pregnancy be intrauterine and the placenta separates gradually from the wall of the womb, this shock may be slow in developing and insidious in nature. If the pregnancy be extrauterine, sudden rupture of a pregnant Fallopian tube or rapid separation of a placenta within the abdominal cavity must be followed by rapidly developing shock. In rupture of veins of the broad ligament the hemorrhage will be considerable and speedy, and shock will develop with evident rapidity. The obstetrician, however, should remember that rapid pulse, depressed condition, sighing respiration, pallor of countenance, restlessness, and clouded vision denote hemorrhage in pregnant patients, whether blood can be seen or not.

Concealed intrauterine hemorrhage is most frequent in cases in which a pathological condition of the endometrium, favoring the separation of the placenta, is present. In syphilitic patients, in those who suffer from endometritis the result of impaired excretion, with brittle capillaries, in patients suffering from the acute infections, and in those subjected to direct mechanical violence, concealed intrauterine hemorrhage is most often observed.

The symptoms of hemorrhage within the uterus of the pregnant patient are those of surgical shock. Locally, the uterus and abdominal wall will be found by palpation in a condition of increased tension. The movements of the fœtus in slowly proceeding intrauterine hemorrhage are at first much increased, gradually diminishing, and finally ceasing as the fœtus perishes from asphyxia. Palpation of the fœtus is obscured by masses of blood-clot. Fœtal heart-sounds become rapid, then slow, and finally cease. The patient complains of pain in the uterus, accompanied by uterine contractions, not, however, vigorous in character. If the condition remains unknown, uterine contractions

gradually cease as the patient passes into syncope and finally perishes from exhaustion.

The management of concealed intrauterine hemorrhage demands constant watchfulness and assiduous treatment. While it is possible for only a small placental area to become detached and for a slight hemorrhage to cease gradually, it is very improbable that either will occur unless under the most favorable circumstances. A factor of great importance is the condition of the endometrium. In a perfectly healthy patient direct violence may cause partial separation of the placenta and hemorrhage, which may cease with absolute rest and the administration of opium. If, however, chronic endometritis is present, and unless the patient is seen promptly and at once controlled, the prognosis for the cessation of the hemorrhage is very poor. In considering these cases the obstetrician must remember that the danger of fœtal death is so great that efforts to save the life of the fœtus are far less imperative than in many of the other complications of pregnancy and labor. The prognosis regarding the mothers and children may be understood from the cases collected by various observers, 153 in all. Of these, $46\frac{7}{10}$ per cent. of the mothers and 94 per cent. of the children perished. The success of treatment in this complication may be learned from the fact that of sixty-three of these patients who had no treatment 64 per cent. died. Seventy-nine of the cases were recognized and treated, and of these but 29 per cent. died. Essentially the same results were shown by others who have studied the subject.

The persistence of intrauterine hemorrhage causes the uterus to enlarge, the blood descending to the lower uterine segment and distending it, gradually softening the cervix and slightly dilating the mouth of the womb. The sensation given to the examining-finger is often that of lateral placenta prævia, the mass of clots taking the place of the placenta.

The first indication in this complication is to lessen the intra-abdominal tension and to bring the uterus to contract directly upon the child, thus compressing the placenta between its wall and the fœtal body. This is accomplished by rupturing the membranes and allowing sufficient amniotic liquid to escape to secure this result. To increase the activity of the uterus ergot or ergotine should be given in quantity sufficient to establish good uterine contractions. The uterus must be emptied as soon as possible. If dilatation has scarcely begun, the vagina should be carefully antisepticized and iodoform-gauze packed into the os and cervix, firmly against the cervix and lower uterine segment. This will bring compression to bear upon the lower portion of the womb and further the dilatation of the os uteri. As soon as possible an elastic bag should be introduced within the internal os and kept thoroughly distended with antiseptic fluid until the hand of the obstetrician or his forceps can empty the uterus by version or extraction.

Following the expulsion of the fœtus the placenta and clotted blood within the womb must be removed, the uterus thoroughly and quickly douched with a hot antiseptic fluid, preferably carbolic acid or some of its derivatives, or, in the absence of this, with hot, sterile water. The use of the gauze tampon within the uterus will usually be indicated

in these cases to stimulate uterine contraction and prevent further hemorrhage. Severe shock has followed sudden removal of a mass of blood-clot within the uterus. The use of the gauze tends to diminish this complication.

During the occurrence of intrauterine hemorrhage, and while delivery is going on, the patient requires constant and skilful attention. The bladder should not be allowed to become distended, as such a condition prevents efficient contraction of the uterus. Strychnine should be given, with digitalis, by the mouth or hypodermatically in tonic doses. Whiskey and milk may be administered to advantage by rectal injection. Small quantities of highly nutritious and concentrated food in the form of broth, beef-juice, or eggs should be given as the patient can take them. If exhaustion threatens through excessive nervousness, morphia and atropia will act as direct stimulants. If the loss of blood has been great, intravenous or subcutaneous injection of normal saline solution is an excellent restorative. The treatment of the patient in this dangerous complication may be summarized by stating that it is the surgical treatment of shock caused by hemorrhage.

Abdominal section for intrauterine hemorrhage is rarely indicated, but certainly failure to lessen the bleeding by methods just described would justify prompt section of the abdominal wall, with hysterectomy. The quickness with which the Porro operation can be performed would indicate its choice in these cases. The prognosis, however, in cases rapidly delivered by speedy dilatation, version, or forceps gives good reason for proceeding promptly with them, with a fair expectation of success. Thus, in eighteen cases delivered by forceps but four deaths are reported. In sixty-three cases treated only by rupturing the membranes and giving ergot, forty died. It is well to bear in mind that pregnant patients suffering with nephritis are especially liable to intrauterine hemorrhage. This furnishes a further reason for the prompt induction of labor in all cases in which nephritis is diagnosticated.

Changes in the pelvis of the pregnant patient. As gestation advances the pelvis undergoes changes which gradually fit it to contain the growing ovum and to permit its expulsion when development has been attained. The joints of the pelvis are rendered more mobile by increased secretion of synovial fluid and by hypertrophy of the ligaments. This produces a condition of relaxation, a compensatory process of considerable value in some cases of difficult delivery. Relaxation of the pelvic joints may become so great as to interfere with walking. These patients complain of pain at the sacro-iliac joints, indicating the rotation of the ilium from the sacrum. In 300 cases the use of an abdominal bandage of twilled cotton, five inches wide, with perineal bands, was advantageous. Cold baths and massage improved some of these cases.

As a partial consequence of the changes in the pelvic joints, and also because of the constantly increasing weight which the pregnant woman must carry, her posture and bearing undergo variations as pregnancy advances. The patient bends her body backward in many cases, curving the trunk alone. The neck is not bent, but the dorsal spine is curved, while the lumbar vertebræ remain unchanged. Just before

labor the pelvis is less inclined than usually. Both femora are directed backward at their upward extremities; the chest is increased somewhat in size by the projection of the sternum at its lower extremity.

The toxæmia of pregnancy. The fact that the pregnant woman must nourish and excrete for herself and her infant renders these processes usually complex and unusually liable to variations which may become pathological. So far as our knowledge goes at the present time, retained excreta in the body of the mother may result in lack of elimination on her part, and also from abnormalities in the metabolism of the fœtus. Investigation shows that the poisons so produced are alkaloidal in nature, resembling most closely the bodies known as toxins. Clinically speaking, they correspond in their action to alkaloidal poisons, especially in their effects upon the nervous system.

Various attempts have been made to isolate poisonous principles in urine and tissue in cases of toxæmia during gestation. The products of muscle-waste are considered of importance by some observers; while in these cases nephritis was absent, the kidneys were highly congested. Others have called attention to the potency of poisons absorbed from the intestinal tract, especially in cases where retroversion of the pregnant uterus had interfered with the free emptying of the intestine. The bacillus coli communis was found to have penetrated the wall of the intestine in many of these cases.

Control-experiments, showing the toxicity of urine during pregnancy, have been made by others. In rabbits tetanic convulsions and death followed the injection of urine. The only lesion found in these cases was congestion of the kidneys. The same condition has been observed in the kidneys of patients perishing from toxæmia. While it was found that only slight structural changes in the kidneys are present in some, marked hyperæmia was observed in the kidneys of fatal cases of children born of toxæmic mothers, the tubules containing casts and the veins being greatly distended. In the livers of toxæmic women advanced congestion has also been observed.

Investigators have studied the condition of the blood in these patients by making cultures in animals. The results were albuminuria, and in some cases suppression of urine. Eclampsia and intense engorgement of abdominal viscera were observed in these animals.

There were also observed extensive disorganization of the blood and congestion of the liver in these cases. Ptomaïnes have been detected in quantity sufficient to produce poisoning in the tissues of women dying with eclampsia.

It is natural to ascribe to bacteria an important part in the causation of this condition. Several observers have respectively ascribed to bacteria a causal relationship and drawn attention to the toxic condition of the blood-serum in these patients, while others draw attention to the fact that syphilis or any profound dyscrasia renders the patient more liable to toxæmic poison produced by bacteria.

Although repeated observations to determine the precise agent causing eclampsia have been made, the sole producer of this condition has not as yet been isolated. Clinical observations show that the production of these poisonous toxins occurs simultaneously with a diminution in

the excretions of the patient. As a clinical index of this condition, the amount of urea and of solids secreted is a symptom of value, to which attention has been drawn by several. These observers have found that the average percentage of urea in a healthy pregnant patient was often as low as $1\frac{4}{10}$, rising after delivery to $1\frac{9}{10}$, or 2 per cent. A marked diminution in the quantity of urea was followed by greatly increased nervousness and threatened toxæmia. Many illustrative cases of ptomaïne-intoxication during pregnancy may be found in the literature of the subject, in which the viscera presented abundant evidence of the presence of poisonous ptomaïnes. Pathogenic germs have been isolated from the blood of pregnant patients suffering with toxæmia by pathologists, whose control-experiments with rabbits demonstrated beyond question the marked toxicity of the urine in these cases. The fact that the kidneys may be but little involved in cases of toxæmia is demonstrated by others who found in twenty-two cases of fatal toxæmia, beyond a general congestion of the kidney, no marked pathological condition. Micro-organisms were absent from the kidneys, nor could a relation be established between the severity of the toxæmic poisoning and the condition of the kidneys.

Examinations of the urine of pregnant patients to ascertain the presence of peptone, by some thought to be a poisonous toxin in these cases, were entirely negative, it being found that peptone may appear in the urine of a pregnant patient after any pronounced disturbance in the general health. The fact that it is not the failure of the kidneys alone which causes toxæmia and convulsions is exemplified by the absence of convulsions in many cases of nephritis. The almost entire absence of albumin from the urine in many cases of toxæmia illustrates the fact that albuminuria is of comparatively slight importance, taken alone in these cases.

A full discussion of the toxæmia of pregnancy would require a very considerable space and cover a wide field. Bouchard's experiments, demonstrating the poisonous nature of toxins, throw a most valuable light upon the question of the toxæmia of pregnancy. It is evident that further research in the direction indicated by Bouchard's work will be requisite before further knowledge upon this subject can be obtained.

The prevention and cure of this condition consist of a careful study of the patient's excretions. In view of the pressure of the pregnant womb upon the contents of the abdomen it is well, as soon as the patient is placed in charge, to ascertain positively that she is not increasing this pressure by faulty clothing. A corset, or any other article of clothing which constricts the abdomen, forcing the viscera down upon the uterus, should be promptly laid aside. It is not difficult to obtain suitable and well-fitting clothes, properly sustained and making no constriction about the waist. Among the poor, waists, simple in design and requiring cheap material, can be readily improvised. Anything which interferes with free circulation is prohibited, and loose shoes only should be worn, garters being fastened to the lower edge of the waist instead of encircling the legs. Thin woollen material should be worn next the skin in winter and in all but the hottest weather of summer.

The selection of a suitable diet for patients threatened with toxæmia is a matter of great importance and well deserving the care of the attending physician. The following diet-list has been found useful with these patients:

Oysters, raw, stewed, roasted, or scalloped, the tough portion of the oyster being rejected if it occasions indigestion; the soft portions of clams may be taken in Little Neck clams or in steamed clams.

Soups should be of the simple variety, *purées* and thick soups containing vegetables being especially good.

Fish in season may be taken abundantly, provided it be broiled, boiled, or baked, without rich gravy.

Meat should preferably be white meat of chicken and turkey, lamb, mutton, and sweetbreads.

Eggs may be employed in moderation if soft-boiled, poached, or scrambled.

Green vegetables are best, potato being least advantageous, but spinach, cauliflower, egg-plant baked, asparagus, and corn being useful. Fresh vegetables in season in moderation form an important article of diet for these patients.

Salads should be of the simple sorts—lettuce, water-cress—and should be taken with French dressing only. As olive oil is nutritious and well adapted for these patients, the free use of simple salads is indicated.

Desserts should be limited to very light puddings or to simple ice-cream.

Condiments must be used very sparingly, a moderate amount of salt being useful; but spices should be avoided.

Milk forms a most useful and essential portion of the diet, but is not well borne by all patients, sometimes causing indigestion and obstinate constipation. It can be often taken as junket, as peptonized milk, or when diluted one-half with effervescing and mildly alkaline water. Milk and Vichy or milk and Apollinaris form a very useful beverage. Those who are fond of buttermilk will find it very refreshing and usually well borne.

Fresh bread should be avoided, and bread made of Graham or Graham and rye, or whole wheat flour is best. Cereal foods, as oatmeal, cracked wheat, and hominy, agree well with some and poorly with others. If taken with milk and salt, they are often well digested. There can be no question that the free and habitual use of tea and coffee by these patients is injurious; tea especially favors obstinate constipation, and produces in the stomach and intestine an irritable condition which is a frequent cause of obstinate dyspepsia. It is best to avoid these articles entirely, substituting hot water containing milk, the very light preparations of cocoa, or water only. To those who like lemonade, slices of lemon in a glass of water form a very agreeable beverage to be taken with meals. The use of water by these patients is very important, and should be made a matter of attention. Water should be taken before breakfast in moderate amount, with meals, between meals, and before retiring. If a glassful containing from four to eight ounces be taken as indicated, the patient will consume from one to two quarts of water in twenty-four hours. The beneficial

effect of this is very soon apparent. Boiled and filtered water is to be employed by those who do not care to go to the expense of purchasing effervescing or alkaline water. The use of alcohol by these patients is most injurious. Occasionally women are seen who greatly relish a small quantity of light beer, which seems to quench thirst and promote sleep. It is rare, however, to find a patient who is not satisfied without fermented beverages.

Fruits are of especial importance in the dietary of these cases. Best of these are apples, oranges, grapes, and peaches. They may be eaten, when ripe, in abundance; and when fruit cannot be obtained suitable for consumption while raw it should be baked or stewed. Prunes, prunelles, and some of the preserved fruits in glass are also useful. Pears are exceedingly wholesome for these patients, either raw or preserved in glass. The berries in season occasionally constipate these cases, and they should be avoided. Melons are generally acceptable and beneficial.

Among the articles to be especially avoided are the heavier meats, as an abundance of beef, while pork and veal should not be taken at any time. Cheese, pastry, sweets, pickles, nuts, and fried food, croquettes, rich sauces, and gravies should be absolutely prohibited.

If the diet which has been indicated is followed, a tendency to constipation present in these cases will be greatly lessened. These patients, however, require more than simple diet to prevent fæcal matter from accumulating in the intestine. Sitz-baths are of especial value, employed as has been stated in treating of the hygiene of pregnancy. In women of plethoric habit cool water is much more beneficial than warm. Many patients find a better action of the intestine by wearing a light flannel band, especially during the warmer months of the year. Very gentle massage of the intestine, carefully avoiding the uterus, may be employed by the patient upon rising in the morning. The importance of suitable dress has already been indicated in considering the hygiene of pregnancy. Exercise of moderate nature is also of great value.

In choosing laxatives for the habitual use of toxæmic patients it is best to employ those which habitually soften the fæces and stimulate the intestine to peristalsis. Compound liquorice-powder or cascara cordial are among the best for prolonged use. The formulæ given in treating of the care of the pregnant patient may be employed in these cases. It is of the utmost importance that constipation be avoided by methods other than the taking of drugs. Occasions will come during the pregnancy when the action of remedies must be invoked to free the patient from temporary failure of elimination; the prolonged use, however, of remedies appropriate at these times is exceedingly injurious because it tends to produce a condition of anæmia which is favored by the chronically poisoned condition of these patients.

In choosing local methods for relieving constipation rectal injections of cold or cool water are among the simplest and best, and are well borne by many patients. The temperature of these injections seems to have a very stimulating effect on the bowel. Gluten suppositories dipped in olive oil are of assistance to many. The injection of olive

oil in quantities varying from four to six ounces is often useful, especially where the rectum is irritable. These measures can be used for a longer period than others without impairing the patient's general health. Where hemorrhoids accompany an obstinately constipated condition the following formulæ have been found of advantage:

Glycerin	℥ ½.
Extract. belladonnæ	gr. ½.
Iodol	grs. 8.
Ol. theobrom., q. s.	

To be made into four rectal suppositories.

Also:

Glycerole of tannin	℥ ½.
Powdered boric acid	grs. 40.
Extract. belladonnæ	gr. ½.
Cocoa-butter, q. s.	

To be made into four rectal suppositories.

The action of the skin must also be stimulated by the wearing of light wool next the skin, by gentle exercise, and by frequent bathing. While the Turkish bath should be avoided, a thoroughly warm bath is most grateful to these patients. The taking of warm water during a warm bath will usually favor free sweating. Gentle massage of the limbs and back is also permissible if given with caution.

An abundant supply of fresh air is of great importance for these cases. While a choice of climate cannot always be made, still the patient's sleeping-room and living-rooms should be abundantly ventilated, and she should spend as much time as possible out of doors. The importance of this precaution is often overlooked in the care of these patients.

It is very noticeable that a profound mental depression is not only the result of this condition, but that, when occurring in a pregnant patient, it very seriously interferes with the excretory function. A prolonged mental strain, often imperceptible at first, has ultimately the same result. While these mental conditions cannot always be avoided, they should be borne in mind and their potency lessened if possible.

It is of the greatest importance that the physician obtain a correct idea of the amount of waste secreted by the patient in a given time. To obtain this it is necessary to measure the quantity of urine passed. The patient should be instructed to measure the amount of urine passed, while the physician does not do his duty to his patient unless the urine is examined at least once in two weeks. This examination should include the presence or absence of albumin, sugar, acetone, casts, blood, pus; while the microscopic examination to demonstrate the presence or absence of casts and discern their character should be also practised. The percentage of urea should also be ascertained; when this drops below 1 per cent. it will generally be found that the patient is suffering from nervous disturbance indicating the presence of a toxæmic condition.

While the quantity and reaction of the urine and its specific gravity

are carefully to be noted, especial precaution should be taken to determine the sort and amount of albumin present, the relative amount of urea, and the relative amount of solids which a given specimen contains. The following methods for examining the urine for various forms of albumin are given by Holland:

If the urine is not clear, insert a cone of filter-paper into the mouth of a test-tube and run the urine through it. Take the reaction with blue litmus-paper. If it reddens, proceed at once to the test; if it does not redden, then to a test-tube containing three inches of urine add one drop of acetic acid. Holding the tube inclined in the flame, heat and boil the upper half only. If the boiled part grows cloudy, then serum-albumin is present. Now boil the whole quantity and set aside for twenty-four hours for the coagulated albumin to settle, and note that the sediment is, say, one-tenth or one-fourth albuminous layer.

As serum-globulin responds with serum-albumin to the above test, to detect it separately let fall a few drops of a fresh sample of albuminous urine into a large glass of water. If globulin is present, the effect of dilution will be to make a milky train for each drop and ultimately diffused cloudiness.

A satisfactory clinical test for peptone is lacking. Not one of the ordinary, easily performed tests is truly characteristic or delicate. The best is Hofmeister's test, which is too complex for bedside-studies.

Hofmeister's test for peptone:

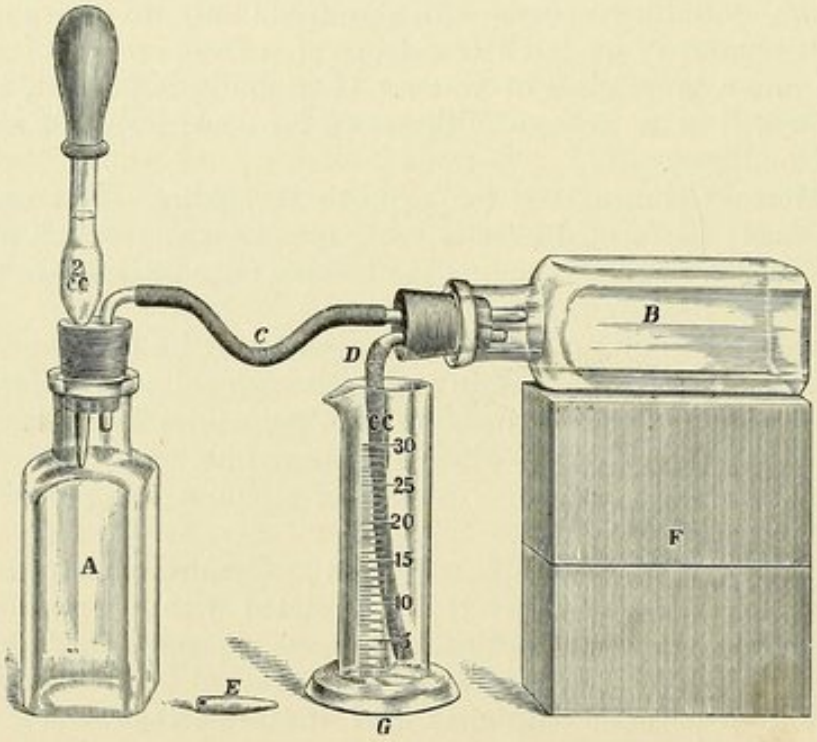
First, test for albumin. If present, remove it by treating the urine with a solution of sodium acetate and then with solution of ferric chloride, bringing to a neutral reaction with potassium hydrate. Now it must be boiled, filtered, and, when cold, tested by acetic acid and heat to see if all albumin is gone. No trace of albumin being present, proceed as follows:

Twenty ounces of urine (albumin free) are treated with neutral lead acetate and filtered. The filtrate is acidulated with hydrochloric acid, and phosphotungstic acid is added as long as a precipitate forms; then it is suddenly filtered. The precipitate is washed on the filter with a dilution of five parts of sulphuric acid in 100 parts of water until all color is removed. The precipitate is removed to a porcelain dish and made alkaline with barium carbonate. The dish is put on a water-bath when boiling, and heated for fifteen minutes and dilute Fehling's solution applied. A bluish-red to violet color will indicate peptone.

The methods of examination for urea which are most often employed in clinical practice are based upon the decomposition of urea by alkaline hypobromites or hyposulphites. Among the simplest forms of apparatus devised for this purpose is that of Doremus, which is used as follows: Fill the vertical tube with a solution of hypobromite of sodium by pouring the solution into the bulb until it is about half full. The apparatus should then be inclined horizontally until the entire tube is filled, about one-third being left in the bulb; then restore the apparatus to the vertical position. Draw into the pipette 1 c.c. of the urine to be tested; pass the pipette into the apparatus, the point being placed immediately under the long arm. Compress the India-rubber cap

slowly, and the gas which is liberated will thus pass up the long tube. It now collects in the upper part of the tube, and its volume being read off indicates the amount of urea from which it has been evolved. In cases where there is much urea it is advisable to mix the urine with an equal amount of water before testing. In this case the result will be equal to one-half of that indicated on the scale. Each division of the instrument indicates 0.01 gramme of urea in 1 c.c. of urine. The percentage of urea is obtained by multiplying the result of the test by 100. To ascertain the total amount of urea voided in twenty-four hours multiply the result by the number of c.c. of urine passed during that period. The instrument is also graduated to the English scale, each division indicating one grain of urea per fluidounce of urine.

FIG. 49.



Squibb's urea apparatus for the approximate estimation of urea in urine

Another method which has been found very useful is that of Squibb, who furnishes a ureometer of convenient form and moderate price. This instrument is used in the following way :

Provide a vessel of water large enough to immerse bottle A, the water being at room-temperature, or about 18° C.=64.4° F.—to be used as a cold bath.

Put one end of the short rubber tube D on the bent glass tube of the stopper of the bottle B, and slip it on to the glass tube just so far that when the bottle B is laid on its side, on its support, the free end of the rubber tube will just clear the bottom of the measuring-jar, as shown in the cut.

Fill the bottle B with water at room-temperature and put the

stopper firmly in place, allowing the displaced water to escape through the tubes; then taking the bottle in the right hand, with the forefinger over the end of the straight glass tube of the stopper, incline the bottle toward the bent glass tube and relax the pressure of the forefinger on the end of the straight tube that water enough may escape to fill completely the rubber tube D; then with the left hand put the little glass stopper E in the free end of D and lay bottle B thus filled on its support; the lid of the box forms a good support if care be taken not to wet and spoil it.

Next put one end of the long piece of rubber tubing C on to the bent glass tube of the stopper of the bottle A.

Measure out the quantity of the reagent to be used in the measuring-jar, and having poured it into bottle A, rinse out the measuring-jar.

Dip the stopper of bottle A into water and put it very loosely in its place.

Dip the mouth of the rubber bulb of the pipette in water, for lubrication, and put the bulb on to the pipette nearly as far as it will go. Compress the large part of the bulb upon the pipette, and having dipped the point in the urine relax the compression entirely. The expansion of the bulb will cause the urine to rise and fill, or nearly fill, the body of the pipette; then taking the body of the pipette between the left thumb and fingers, while the point is still immersed in the urine, with the right thumb and forefinger applied to the rubber ring at the mouth of the bulb, screw the bulb upward on the pipette so that the urine may slowly rise to the mark until the lower limb of the meniscus lies just above the mark. Now, when the point of the pipette is raised out of the urine, the meniscus will fall a little and lie exactly on the mark; then screw the bulb a little higher so that a very little air may enter the point of the pipette to prevent loss of the measured urine.

Pass the lower end of the charged pipette through the vacant hole in the stopper of bottle A, and then screw the stopper into its place by holding the stopper firmly and turning the bottle upon it.

Then put the free end of the long rubber tube C on the end of the short rubber tube D, and allow the few drops of water that will flow to escape, seeing that the flow ceases completely.

Then put the empty measuring-jar in its place under the tube D to receive the displaced water of the process, when the preparation for the process will be complete.

If solution of chlorinated soda is to be used as the decomposing reagent in the bottle A, a warm bath of sufficient size to immerse the bottle should be now provided, the water to be not warmer than about 35° to 40° C. or 95° to 104° F. The other reagents given here do not need a warm bath, as the time of reaction is short.

Take the bottle A by two opposite corners at the bottom, between the right thumb and forefinger, and take the upper part of the pipette with the left thumb and fingers in readiness to compress the rubber bulb, shaking the lower part of the bottle from side to side, and not up and down. During this gentle shaking compress the bulb so as to force all the urine out of the pipette into the bottle with the reagent. Active effervescence will soon commence, and while it is

active relax the compression of the bulb gradually and completely, slipping the thumb and fingers which compressed the bulb down to the stopper and lip of the bottle. Hold this part loosely but steadily while the lower part is still shaken from side to side pretty actively. If this be properly done, no liquid, or but a drop or two, will get into the rubber tube to be carried over into bottle B. Continue the shaking as long as bubbles of gas come over into bottle B, or until they are so small and so infrequent as to be accounted for by the expansion in bottle A from the warmth of the hands. If chlorinated soda solution be used as the reagent and without a warm bath, the shaking will require twenty to thirty minutes; but with the warm bath not more than six to eight minutes.

Bottle A is then immersed in the cold bath at 18° C.=64.4° F. for about four minutes. During this immersion the contraction in bottle A will draw water from bottle B into A, and from the measuring-jar back into bottle B, and when there is no longer any change in the measuring-jar the contraction is finished.

The bottles are now lifted off and set aside to be prepared for a new assay, and the contents of the measuring-jar are carefully read off to half a cubic centimetre, and the quantity thus obtained is noted and referred to the first column of the urea table. There the proportion of urea present is found calculated in percentage, and in grammes and grains for various measures of urine.[1]

Reagents.

Among the reagents that may be used for decomposing the urea of urine by this apparatus, the following are the most convenient and the best:

First. The solution of chlorinated soda of the U. S. Pharmacopœia of 1840 to 1870, inclusive. (The solution of the U. S. Pharmacopœia of 1880 must be avoided, as it will not answer the purpose at all.) The solution of 1870 can always be had from E. R. Squibb & Sons, and they now and in the future will make it only by this formula and process; but if this solution of 1870 be not accessible when this apparatus is to be used, it may be extemporaneously made by the following formula and process from the chlorinated lime supplied with the apparatus or from any other source. Fifteen to twenty cubic centimetres of this solution are sufficient for each assay.

Second. Extemporaneous solution of chlorinated soda.

Take of chlorinated lime (chloride of lime or bleaching-powder) 20 grammes or 318 grains, and sodium carbonate (common washing-soda or "sal soda") 40 grammes or 636 grains.

Shake the chlorinated lime in a bottle with 45 c.c. or 1½ fluidounces of water until thoroughly disintegrated and the lumps all broken up, allow the mixture to settle for a minute or two, and pour the thin portion upon a paper filter in a funnel, filtering into a bottle of about 100 c.c. capacity. Shake the thick residue remaining in the bottle

[1] For further information on the subject, see Ephemeris, vol. iii. p. 1315.

with 30 c.c. or 1 fluidounce more water, and, when the first portion of the filter has drained through, pour the whole of the second portion on to the filter and allow this to drain through.

Then dissolve the sodium carbonate in 30 c.c. or 1 fluidounce of hot water and add this solution to the filtrate in the first bottle. Shake the solutions well, and, if the mixture gelatinizes, warm the bottle and shake until it liquefies, and then pour it upon a new paper filter, filtering off the clear solution into a bottle marked at 100 c.c. When the filtrate has drained through pour water into the filter until the filtrate reaches the 100 c.c. mark on the bottle. This solution is about equivalent to that of the U. S. Pharmacopœia of 1870 for this assay, and when recently made 10 c.c. of it are sufficient for each assay, but when old or made from old chlorinated lime 15 c.c. are a safer quantity.

Third. Solution of chlorinated lime.

Take of chlorinated lime ("chloride of lime") 40 grammes or 617 grains.

Water, a sufficient quantity.

Shake the chlorinated lime well with 120 c.c. or 4 fluidounces of water, and after the mixture has settled for a minute or two pour off the thinner portion into a paper filter and filter into a bottle marked at 200 c.c. or 6⅔ fluidounces. Add 80 c.c. more water to the thick residue of the chlorinated lime, again shake well, and pour the whole upon the filter after the first portion has nearly all drained through. When the second portion has drained through pour water on to the residue in the filter until the filtrate reaches the 200 c.c. mark on the bottle; then cork the bottle and shake it, and label it solution of chlorinated lime, 2 grammes in 10 c.c., and date the label.

This solution is the best of all the reagents yet tried for the decomposition of urea. It is very efficient when a month old, but how much longer it will retain its efficiency is not known. Its reaction with the urea is very prompt in two stages of very active reaction, which are usually from one to three minutes apart. Then the end-reaction is fairly sharp. The whole time of shaking is usually not more than six minutes, and a warm bath is not needed. Even when made from an 18 per cent. chlorinated lime solution 10 c.c. of the solution are quite sufficient for an assay, and therefore the above formula yields enough for twenty assays, and the bottle of chlorinated lime supplied with the apparatus contains about enough to make solution for forty assays before it will need replenishing. When empty it may easily be refilled by buying half a pound of "chloride of lime" from any trustworthy source, at a cost of ten or fifteen cents.

Fourth. Solution of sodium hypobromite.

This, as applied by the improved process of Dr. Charles Rice, is kept in two separate solutions, which are mixed near the time of using them.

The solution of caustic soda is made by dissolving 100 grammes of caustic soda in 250 c.c. of water; the resulting solution measures about 284 c.c.

The solution of bromine is made as follows: Bromine is commonly sold in one-ounce stoppered vials, packed in chalk or whiting, in a tin

can, and careful warming of the neck of the vial is needed in order to get the stopper out. These vials, on an average, contain less than an ounce, and the quantity must be ascertained by weighing the vial and contents after the stopper is loosened, pouring the contents into a bottle of about 300 c.c. or 10 fluidrachms capacity and then weighing the empty vial and subtracting its weight; then add to the bromine in the bottle an equal weight of either sodium bromide or potassium bromide, and as many cubic centimetres of water as eight times the number of grammes of the bromine, and shake until the bromine is dissolved, when the solution is ready for use.

For the assay this and the soda solution are taken in equal measures and are mixed near the time of using, in any desired quantity. If but one or two assays are to be made, they may be measured directly into bottle A and be mixed there, using the measuring-jar for the purpose and measuring the bromine solution first. Whilst 2.5 c.c. of each solution with 5 c.c. of water are sufficient for an assay, it is better to make 3 or 3.5 c.c. for safety, and the measure should be made up to 10 c.c. with water. The reaction is very prompt and the end-reaction is fairly definite and sharp, and there is no perceptible double reaction with an interval between them, as in the chlorinated lime solution, unless there be a larger dilution. So long as they are not mixed these solutions keep indefinitely, and therefore when the trouble of making them is over they are very convenient for use, the results being more uniform, but a little lower than those from the solution of chlorinated lime.[1]

Table of Approximate Proportions of Urea in Urine for Clinical Use.

One cubic centimetre of nitrogen gas at 0° C. = 32° F., equal to 0.0027 gramme of urea.

Assumed room-temperature for measurements, 18° C. = 64.4° F.

Rate of expansion, 0.003663 time the volume for each 1° C. Correction applied for 18° C. = 32.4° F. is 0.003663 x 18 = 0.0659 subtracted for each 1 c.c. as read off from the measuring-jar, and the percentage is calculated from the corrected reading.

Thirty cubic centimetres are assumed as equal to one fluidounce, but in converting any considerable quantities from one measure to the other 29.52 c.c. should be taken as one fluidounce.

In converting measures to weights, and in using measures and weights together, an assumed specific gravity for abnormal urine is taken, namely, 1.025 at 25° C. = 77° F., and 30 c.c. of urine of such specific gravity weighs 3075 grammes and one fluidounce weighs 467.4 grains.

Four hundred and seventy-three cubic centimetres are assumed as equal to one pint of sixteen fluidounces, and when these measurements are used for urine they are assumed as weighing (1.025 x 473=) 484.83 grammes and (467.4 x 16=) 7478 grains, respectively.

[1] For further information on the subject, see Ephemeris, vol. iii. page 1315.

The seventh and eighth columns must not be taken as having any definite relation to or bearing upon the assay, excepting when the total twenty-four hours' excretion amounts to just 1181 c.c. or 40 fluidounces, or very near to this measure, as the calculations are based upon this arbitrary quantity.

Reading of the measuring-jar in c.c. (Corrected.)	Percentage of urea.	Urea contained in 30 c.c. or 1 fluidounce of urine.	
		Grammes.	Grains.
4	0.50	0.1538	2.34
5	0.63	0.1937	2.94
6	0.76	0.2337	3.55
7	0.88	0.2706	4.11
8	1.01	0.3106	4.72
9	1.13	0.2475	5.28
10	1.26	0.3875	5.89
11	1.39	0.4274	6.50
12	1.51	0 4643	7.06
13	1.64	0.5043	7.67
14	1.77	0.5443	8.27
15	1.89	0.5812	8.83
16	2.02	0.6212	9.44
17	2.14	0.6581	10.00
18	2.27	0.6980	10.61
19	2.40	0.7380	11.22
20	2.52	0.7749	11.78
21	2.65	0.8149	12.39
22	2.77	0.8518	12.95
23	2.90	0.8918	13.55
24	3.03	0.9317	14.16
25	3.15	0.9686	14.72
26	3.28	1.0086	15.33
27	3.40	1.0458	15.89

LIMITS CONSISTENT WITH ORDINARY HEALTH IN ADULTS (PROBABLE).

Urea contained in 473 c.c. or 1 pint of urine.		Urea contained in 1181 c.c. or 40 fluidoz. of urine.		
Grammes.	Grains.	Grammes.	Grains.	
2.425	37.44	6.055	93.60	
3.054	47.04	7.625	117.60	
3.685	56.80	9.200	142.00	
4.267	65.76	10.653	164.40	
4.897	75.52	12.227	188.80	
5.479	84.48	13.680	211.20	
6.110	94.24	15.255	235.60	
6.739	104.00	16.825	260.00	
7.321	112.96	18.278	282.40	
7.951	122.72	19.853	306.80	Lowest.
8.582	132.32	21.427	330.80	
9.164	141.28	22.880	353.20	
9.794	151.04	24.455	377.60	
10.376	160.00	25.907	400.00	
11.005	169.76	27.478	424.40	
11.636	179.52	29.053	448.80	
12.218	188.48	30.505	471.20	Normal.
12.849	198.24	32.080	495.60	
13.430	207.20	33.533	518.00	
14.061	216.80	35.107	542.00	
14.690	226.56	36.678	566.40	
15.272	235.52	38.131	588.80	
15.963	245.28	39.706	613.20	
16.484	254.24	41.158	635.60	Highest.

The advantage of those methods which do not employ bromine lies in the absence of the very irritating gas which is set free during the process of examination. This especially recommends Squibb's apparatus, which is useful, very convenient, and not disagreeable to use.

In estimating the solids excreted through the action of the kidneys it must be remembered that a person of average weight excretes about 1200 cubic cms. of urine in twenty-four hours, giving on an average about 950 grains of solid matter. The amount has been found to vary, in proportion to the weight and activity of the patient, from 500 to 1100 grains, and an average excretion would be from 900 to 1100. Several methods are advised for the estimation of the amount of solids excreted, one of which is the simple method accredited to Trapp, which is to multiply the last two figures of the specific gravity by 2, which will give approximately the number of grammes of solid matter in 1000 cubic cms. of urine. Haeser uses the coefficient $2\frac{33}{100}$; Haines modifies Haeser's method and gives the following rule, namely, multiply the last two figures of the specific gravity of the urine by the number of ounces voided in twenty-four hours and the product by $1\frac{1}{10}$. The clinical value of the estimation of the solids of urine consists in the fact that it is the salts of potassium, together with urea, which are the most toxic agents in urine. This fact gives us an indication for treatment and leads us to avoid the use of salines containing an abundance of potassium as laxatives.

To make a correct diagnosis of the toxæmic state the physician must study the quantity and composition of the patient's excreta and the phenomena connected with the cerebro-spinal axis. The first can be ascertained by questioning the patient and accurately observing her. The second requires a careful examination of the patient's general condition. It must be ascertained whether pain is present, of what sort and where; whether headache, thirst, lassitude; disturbances of vision, hearing, taste, should also be noted. Sleeplessness or lethargy, irritability or apathy, must be recognized; while melancholia and nausea and vomiting must be appreciated or eliminated. Presence or absence of perspiration gives evidence of value which should not be neglected. The presence of serum-albumin in the urine and swelling of the legs and feet are of secondary and not of primary importance.

The eliminative treatment of patients suffering from toxæmia is a matter of the utmost importance. The first necessary step is to lessen the taking of injurious substances by carefully regulating the diet. When this has been done in accordance with the statements previously made in treating of diet in this condition, the patient should next be put, if possible, at rest in bed. Many patients by habitual overexertion tend to produce more waste than they can eliminate. The action of the skin should be stimulated by a hot full bath, by a hot pack, or by a hot-air bath. If a full bath is taken in a tub, the patient should not be left alone, as syncope sometimes occurs in these cases. A cloth wrung out of cold water should be kept upon the head and the patient should drink hot or cold water freely while in the bath. If the heart-action seems feeble, she should be given a small amount of alcohol, or of coffee, as soon as she leaves the bath.

The hot pack is given by spreading a rubber sheet upon the patient's bed, and upon this a blanket wrung out of hot water. The patient lies upon the blanket, her clothing is removed, and the blanket is folded over her. An additional blanket wrung out of hot water is placed

about her, and over this a dry one. A cold cloth or ice-bag is kept upon the head, and the patient may take fluid freely if she is thirsty.

A hot-air bath is given by enveloping the patient in blankets and raising the blankets from the bed at its foot by a simple frame. An alcohol lamp may be used to heat the air, over which is placed the enlarged end of a long tin tube. The further end of this tube is introduced beneath the blankets, and thus the heated air is brought in contact with the patient. A steam bath may be given by using a tea-kettle with a long spout, similar to a croup-kettle, and introducing the steam beneath the blankets covering the patient. The most convenient and efficient way of inducing perspiration is in the hot bath or the hot pack; one of these can usually be obtained in the house of any patient.

The tongue in these cases is usually furred and coated, denoting a very sluggish action of the liver. This calls for active treatment and for the administration of mercurials. Calomel may be given in doses of $2\frac{1}{2}$ grains with 5 or 10 grains of sodium bicarbonate; this to be followed in six or eight hours by an ounce of sulphate of magnesium or by the rectal injection of the following:

Magnesium sulphate	℥ 2.
Glycerin	℥ 2.
Spirit of turpentine	℥ ½.
Castile soapsuds	quart 1.

This will usually produce a very free evacuation of the intestine. This may be repeated on the succeeding evening, the saline being given on the following morning until the tongue is thoroughly cleaned. Such patients should always be examined to detect the presence of hardened fæces, whose removal may require the injection of ox-gall or of some other suitable dissolving-substance.

In some cases the use of calomel results in a marked increase in diuresis, but in no especial activity in the action of the liver. Where such is the case it will often be found that minute doses of bichloride of mercury, $\frac{1}{250}$ of a grain, twice daily for a few days, will be far more efficient. This may be best given in powders with sugar of milk.

One of the advantages derived from the use of calomel is its action in rousing the activity of the kidneys. In patients whose circulation is feeble digitalis should be given at the same time in the form of tincture, fifteen drops three times daily, or the infusion, which is preferred by some. Where a single large dose of calomel is unsuccessful in increasing the action of the kidneys, small doses at more frequent intervals may be employed; one-eighth of a grain given every hour for eight doses. Others obtain a better result from giving one-half of a grain three times daily for two or three days. If salines be used freely, there is very little danger that constitutional effects will be noticed from the giving of the mercury.

When the patient has begun to excrete, very much can be done to continue the process and to prevent a recurrence of her former condition. Massage, preceded or followed by alcohol baths, will assist greatly in promoting the action of the skin and also serve to stimulate the patient's general strength. The inhalation of oxygen has been practised

by some in these cases with the hope that the increased oxidation of waste-material may benefit the patient. If a sedative is desired to produce sleep, the effect of a bath or pack should be tried, and in many cases this is quite sufficient. If recourse must be had to drugs, hydrate of chloral in 10-grain doses may be employed; usually, however, increased elimination is followed by refreshing slumber. No greater mistake can be made than to treat these patients by the administration of bromide of potassium, or mixed bromides, or bromides and chloral only. The result is simply to mask the symptoms, while the addition of potassium salts to the blood favors the development of eclampsia. Morphine is contraindicated, while, if any form of opium seems necessary, codeia is most valuable.

In cases where obstinate intestinal indigestion is present, as manifested by the symptoms of so-called "biliousness," nitro-hydrochloric acid may be employed in doses of one to three drops three times daily, well diluted and taken through a tube after meals. This remedy should be used with caution, but is most useful in some cases. In plethoric patients in whom the phenomena of congestion predominate dry cups applied over the kidneys may be of considerable service. Their beneficial effect will be noticed by an increased flow of urine.

These patients are nearly always in a condition of anæmia from chronic interference by toxins with the processes of nutrition. Arsenic is generally the best tonic which can be given them, and should be used in the form of Fowler's solution, from one to five drops three times daily, taken with an abundance of water and after food. If iron is to be used, Basham's mixture is a useful preparation. The pepto-manganate of iron or the citrate of iron and manganese may also be tried. As soon as the patient is able to be up she should be sent into the fresh air and every means taken to recruit her strength.

The distinction between albuminuria and toxæmia of pregnancy is to be sharply drawn. The presence of serum-albumin only in the urine, with hyaline casts, and accompanied by swelling of the feet and ankles, is a condition not infrequently seen in multigravidæ and not attended with especial danger. Pregnancy goes on to term, and a healthy child is delivered in the majority of these cases. Most of these patients suffer from relaxed arterioles and weak or feeble heart. They require, in the way of treatment, cardiac tonics and proper diet. In distinction to these cases are those suffering from toxæmia, in which the secretion of urine is deficient and in which elimination by the skin, intestines, and lungs is also lacking. There may be but a trace of serum-albumin in the urine of these patients, with no casts. These patients are restless, anxious, often melancholic, complaining of headache, deficient appetite, often thirst, sleeplessness, and great apprehension. The first class of cases is readily amenable to simple treatment, while the second requires thorough scrutiny, careful examination, and prolonged and persistent attention. In the first the prognosis is favorable; in the second it must be guarded, both as concerns the life of the child and the safety of the mother. Should she pass through her labor without eclampsia she may develop nephritis after pregnancy.

Disorders of the Nervous System during Pregnancy.

The additional strain upon the patient's vitality which pregnancy entails often manifests itself in increased susceptibility to neuralgic pains. As is usual in neuralgia, this manifests itself most readily in some region of the body where an irritant cause is present. Thus, decayed teeth favor the development of severe facial neuralgia, while habitual constipation, through the irritating presence of hardened fæces, often causes severe neuralgia in the pelvic region. If the fœtus is of large size, it may press so firmly upon the nerve-trunks at the brim of the pelvis as to cause cramp and sciatic pain, which may interfere seriously with the patient's general condition. Where the uterus is retroverted during early pregnancy habitual constipation results in the lodging of large masses of fæces at the brim of the pelvis, against which the growing uterus makes pressure, causing severe neuralgia of large nerve-trunks. Neuralgia of the muscular nerves is often observed in the regions of the thighs, and painful spasmodic contraction of the muscles is not infrequently present.

Occasionally obstinate pain, extending down the thigh to the knee or lower, forms a constantly depressing influence upon the patient's health. In a patient who has had pelvic inflammation at some previous time pelvic adhesions and exudate are also important factors in causing obstinate pain. In patients who have been subjected to abdominal section and who afterward become pregnant peritoneal adhesions to the uterus may occasion considerable distress during the time when the uterus is rising out of the pelvis. In most cases, however, they are sufficiently elastic to stretch gradually, and often become separated after the fourth or fifth month. Where they do not do so they cause pain and may favor the occurrence of abortion.

In treating patients for malposition of the pregnant womb, causing interference with the rectum through pressure, the obvious necessity lies in raising the uterus in the pelvis, thus relieving the obstruction to the intestine. This, however, cannot be done at once, but must be performed in a manner which does no violence to the uterus and is not likely to set up abortion. An effort should first be made to empty the bowels as thoroughly as possible, not only by purgatives administered by the mouth, but also by high injections of salines, glycerin, and turpentine injected with the use of the rectal tube. These may be taken with the patient lying upon her left side, the fluid being introduced as slowly and gently as possible and the patient retaining the injection for half an hour or an hour after its administration. In cases where the womb is congested and an irritable condition of the os and cervix is present, it is well to relieve the congestion by raising the uterus upon strips of surgeon's lint thoroughly saturated with glycerin. These may be inserted, while the patient lies upon her left side, with the use of the Sims speculum. A free flow of watery mucus will result, with very considerable lessening in the congestion and hyperæmia present. In addition to this measure, all pressure should be taken from the patient's abdomen and pelvis by sustaining the weight of the clothing directly or indirectly from the shoulders. This is readily accomplished

by the use of some of the various forms of waists now so frequently employed. If the uterus shows a disposition to fall backward again, it may be sustained by suitably moulded tampons of carded wool, smeared with an antiseptic ointment. When the uterus is in proper position and the intestine empty of irritating feces, if pelvic neuralgia exists, its most probable cause lies in pressure upon nerve-trunks by pelvic exudate following some previous inflammation or septic infection.

Occasionally malarial intoxication forms a persistent cause for neuralgia of various kinds. Facial neuralgia and hemicrania are sometimes most annoying and persistent. Where pain from this cause is obstinate and prolonged, the loss of sleep to which the patients are subjected acts as a powerfully depressing influence upon their strength.

The general treatment of neuralgia during pregnancy should be conducted upon the plan of removing at once any irritating focus. Local applications of menthol or iodine are indicated. The patient should be put completely at rest, systematically fed, and given tonics, such as iron, arsenious acid, and quinine.

In choosing a preparation of iron for use in neuralgia those should be selected which do not tend to produce constipation. The sulphate, the citrate of iron and ammonium, and the tartrate of iron and potassium are especially useful. It is often necessary to combine iron with bitter tonics to produce the best possible result. Neuralgic patients are usually badly nourished, and the use of oil is very desirable in their food. Cod-liver oil is the best, given in a freshly made emulsion or in capsules. Olive oil often serves a useful purpose, and may be used in food or combined with egg in the following mixture:

Olive oil		2 parts.
Glycerin Yolk of raw egg	each	1 part.

Of this a teaspoonful to a tablespoonful may be taken after each meal.

In patients who are not pregnant pelvic neuralgia is often treated to great advantage by the galvanic current of electricity. While great caution should be used in applying the electric current about the pelvis during pregnancy, still cases might arise in which this method of treatment would be justifiable.

Where pain is severe enough to be distressing, alcohol at regular intervals, taken with food, is most useful. To procure sleep, sponging at bedtime with hot water and alcohol or the application of cold to the head is often efficacious. In cases of pelvic neuralgia phenacetin, given by rectal suppositories of ten grains each, is of considerable value. Morphine and atropine are of use when better means fail. Chloral and the bromides have but little influence.

Abnormalities in various glandular secretions of the body frequently complicate pregnancy. An unusual flow of saliva or of tears may occur during the period of gestation. Salivation during pregnancy has long been recognized as one of its most annoying complications, and has taxed the resources of obstetricians in treatment. There is no one drug which is of especial avail in these cases.

The general condition of the patient must first be improved. Abundant rest is clearly indicated. The administration of drugs which enhance the nutrition of the nervous system, such as the hypophosphites, arsenic, and iron, is advantageous. Cocaine in 5 per cent. solution has been useful in some cases. The electrical current has been applied to the head and face with advantage, especially in cases in which the secretion of saliva had become excessive.

Excessive perspiration is also a disordered glandular secretion which occasionally causes great discomfort in weak, anæmic, and poorly developed pregnant women.

Herpes usually occurs between the third and fifth months of gestation, rarely so late as the sixth or eighth. In rare cases the eruption does not appear until the last few days of the puerperal state. The distribution of the lesions is usually irregular, the anterior surface of the body being most frequently affected. Large patches of redness, often covered with bullæ of considerable size, are observed in these cases. Herpes shows a strong tendency to recur during subsequent pregnancies. Although the burning and itching in these cases are excessively painful, yet, except in extremely weakened patients, the general health usually remains good. Pregnancy is rarely if ever brought to a premature end by herpes, but the end of pregnancy is followed by the rapid disappearance of the disorder. In puerperal patients herpes causes fever, perspiration, and general pruritus, followed in twenty-four hours by the characteristic eruption. Evidence that the fœtus and its appendages are affected by herpes is not forthcoming. The eruption often takes mixed forms, resembling that of syphilis and also pemphigus, and especially when seen in young women.

In considering the treatment of herpes during pregnancy the neurasthenic element must be kept constantly in mind. Such patients are almost uniformly found to be depressed and wanting in strength and nervous energy. Accordingly, tonics addressed to the nervous system, such as arsenic, strychnine, hypophosphites, and iron, are primarily indicated. In the absence of a specific for the disease the eruption may be allayed by applications of borated vaseline, glycerole of starch, lime-water and oil, and any soothing and alkaline application. When herpes is fully established, compounds of bismuth, powdered starch, or starch and talcum may be tried. When the itching becomes intolerable anodyne applications, such as menthol, carbolic acid, hydrate of chloral, or corrosive sublimate, sometimes give relief. In cases where considerable areas are affected soothing baths with bran, gelatin, or starch are indicated.

Where the eruption of herpes is limited it will be found convenient to cover the diseased surface with collodion. In other cases antipyrin in spray or in solution, applied with a soft brush, in strengths of ten to twenty grains to the ounce, may give relief.

While herpes itself during pregnancy is not necessarily a grave disorder, still it may profoundly influence labor by weakening the mother through long-continued depression before birth occurs.

Cerebral affections during pregnancy. Thrombosis and hemorrhage may occur during gestation as the result of some grave visceral

disorder. The cerebral veins are often found occluded in these cases. As is observed with most patients in whom cerebral thrombosis and hemorrhage occur, an infective focus should always be kept in mind in the study of such cases and diligently sought for.

Inflammation of the membranes covering the brain forms a most severe complication of pregnancy. The artificial termination of pregnancy does not seem to influence the result so far as the mother is concerned. Many of the children so born survive. In some cases birth is spontaneous before the death of the mother. In view of the grave prognosis labor should be induced as soon as viability is present.

Spinal irritation. In view of the general hyperæmic condition of the vascular system during pregnancy it is not strange that spinal irritation should develop in some cases. Tenderness on pressure along the spines of the vertebræ is always present. Functional disturbances of various organs of the body are also observed. In seeking for a cause for these cases it is well to remember the fact that many of the acute affections leave behind them such a condition. Thus, after diphtheria, typhoid infection, and other similar complications of pregnancy the condition in question may be found.

Sudden death. Sudden death during pregnancy most frequently results from the entrance of air into the circulation and usually through some interference with the sinuses of the uterus. Vaginal injections, if given with considerable force, are especially dangerous to pregnant patients. This danger is augmented when a syringe is used which forces fluid into the vagina and cervix by intermittent contractions. Thus, a piston-syringe or a Davidson syringe should not be used for vaginal irrigation during pregnancy. A fountain-syringe is most appropriate, and the bag should not be placed higher than three feet above the patient.

Sudden heart and respiratory failure are not uncommon among pregnant patients. Cases in which nausea and vomiting have been well marked during the early months of pregnancy are especially liable to these complications. Large doses of anodynes seem to favor this tendency. The immediate cessation of vital functions may also be observed after profound nervous shock, as in the case of sudden fright or the reception of sudden and distressing news.

Maternal impressions. Whatever may be the explanation of malformations of the fœtus following profound shock to the mother, the fact that such phenomena occur is indisputable. In the absence of demonstration of the anatomical changes in the mother which produce these conditions in the fœtus they must be ascribed to the agency of the nervous system. The literature of obstetrics abounds in such reported cases. Among others, the writer is cognizant of a case in which a profound mental shock was conveyed to a pregnant woman by the information that an intimate friend had been killed by being thrown from his horse. In the fall his head was severely wounded. When the mother was delivered, upon her infant's head was a corresponding area which has remained red and sensitive and upon which the hair has never grown. Obstetricians of extensive observation report numerous cases of similar phenomena.

In determining whether a given disturbance of the nervous system is likely to be followed by fœtal malformation the element of suddenness is of decided importance. It is observed that in nearly all of these cases the shock to the nervous system has come upon the mother unprepared; while, on the other hand, young pregnant women frequently see those who are dear to them pass through a dangerous illness, or meet with gradual reverses of fortune, or are placed in trying positions which develop gradually, without malformation of the fœtus. For example, if it becomes necessary to perform a surgical operation upon a member of the family, the mother of which is pregnant, if the procedure be explained to her without detail, and she understands the nature of and reasons for the step, she will rarely suffer from its occurrence and her fœtus will escape injury. Impressions made through sight, or through the imagination which calls upon visual images, seem to be the most powerful in producing fœtal malformations. It is certainly proper that no terrifying or disgusting object be shown to a patient in the condition of pregnancy.

Chorea. Pregnancy aggravates chorea in a very marked way. Not only does the general muscular system become profoundly convulsed, but choreic movements may extend even to the uterus. A case has been reported in which choreic uterine contractions could be distinctly observed. Notwithstanding the violence of the muscular contractions of the uterus the pregnancy was uninterrupted and the patient was delivered at term in normal labor.

Various classifications of chorea during pregnancy have been made. Some describe true chorea, a hysterical, and a blended type. Most cases are seen in patients as young or younger than twenty. True chorea more often affects primigravidæ. As fœtal movements develop they occasion an exacerbation in the choreic condition. As in the non-pregnant, rheumatism is the most frequent predisposing cause. Any condition of the nervous system which has led to convulsive movements tends to bring about chorea during pregnancy. In some patients anæmia and profound mental disturbance are followed by chorea. The pathology of the disease in the pregnant is essentially the same as that in the non-pregnant.

The ultimate effect of chorea upon pregnant patients varies in accordance with the severity of the choreic complication. Mild cases do not affect the pregnancy. Severe chorea, hyperpyrexia, and profound cerebral disturbances are accompanied by abortion and death. Grave disorders of the nervous system, as mania, paralysis, and delirium, occasionally follow chorea during pregnancy.

The prognosis for the child, when the mother is choreic during pregnancy, depends upon the period of pregnancy at which the chorea develops. If the child be near term, it will rarely suffer essentially from the maternal disorder. The earlier in pregnancy that chorea develops the graver is the prognosis for the life of the fœtus. Delivery does not always terminate choreic movements. The complication gradually ceases during the puerperal state. In women who have been choreic in childhood pregnancy acts as a powerful exciting cause to a recurrence of the disorder.

The differential diagnosis between chorea, epilepsy, and hysteria in pregnant patients is interesting and sometimes difficult. Hysterical patients move more slowly and with a certain sequence in their actions. In hysterical women sensibility is usually altered. Cases of unilateral chorea are sometimes observed in the non-pregnant, but during pregnancy chorea is usually bilateral. Pregnant patients often show the depressing influence of chorea by impairment of memory and a generally depressed nervous condition.

Impairment of the respiratory muscles and of the organs of speech is also observed in choreic and pregnant patients. Choreic pregnant patients sometimes fail to recover properly, but remain insane or demented.

Chorea during the puerperal state usually develops in susceptible patients at the third or fourth day after delivery. The irritation of the nervous system caused by the formation of milk, and also by the purgation to which patients are usually subjected at this time, is advanced as an explanation of the occurrence of this complication at this particular period. Occasionally chorea reappears in the newborn infant, and the mother's choreic movements are reproduced in the convulsive movements of the child.

In the treatment of chorea in pregnancy the patient should be put absolutely at rest and her general condition improved by proper feeding, the administration of arsenic, and suitable measures to insure good digestion.

In employing arsenic it is well to use it in increasing doses, freely diluted. One drop three times a day may be used in beginning, increasing one drop for each dose until five are taken three times daily, when the dose should again be reduced to one drop. Should puffiness about the eyes or symptoms of intestinal irritation develop, the remedy must be stopped temporarily or its dose very much lessened. Fluid extract of cimicifuga may be given in doses of one-half a teaspoonful three times daily. Recalling the relation which rheumatism bears to chorea, if there be any reason to suspect a rheumatic element in the case, sodium salicylate should be given, ten grains four times daily. This should be continued but a few days. The great danger to which these patients are exposed arises from the exhaustion from the incessant movements. This can often be allayed and sleep induced by the use of the pack at night. The temperature of the water should be tepid or warm. The pack should be given at bedtime, and a half-ounce of whiskey with milk or egg should be taken at that time. The result will often be the occurrence of a considerable period of sleep. Hypnotics and sedatives are often necessary in these cases, but their use should be limited as far as possible because of their tendency to depress the general strength and interfere with processes of nutrition. Hydrate of chloral may be used in the following combination :

Chloral hydrate		grs. 160.
Ammonium bromide Sodium bromide	each	grs. 80.
Simple syrup		℥ ½.
Water to make		℥ 2.

A teaspoonful every hour until three doses have been taken.

Codeia in the form of phosphate may be given hypodermatically in one or two doses of one-half grain each. Trional, sulphonal, or tetronal may be tried.

If it becomes necessary to perform any manipulation about the uterus in the choreic patient, it is often best to anæsthetize her with bromide of ethyl or chloroform rather than increase her movements by the irritation of an examination or application. Labor is sometimes rapid and violent in these patients, because the choreic condition seems to exacerbate the muscular contractions of the uterus. Care must be taken to control the patient during labor, to avoid serious lacerations.

The anæmia which usually is present in the choreic patient predisposes to hemorrhage at labor, and when choreic movements are violent it is often difficult for the obstetrician to control the uterus during parturition. Post-partum hemorrhage in choreic women and the exhaustion and anæmia which the condition brings about increase greatly her danger from any form of sepsis. Nursing seems to exacerbate chorea during the puerperal period by the irritation which the child produces upon the nerves of the breasts.

It is the duty of the obstetrician to interrupt pregnancy complicated by chorea when the complication is exhausting the patient through excessive muscular action and loss of sleep. If a grave physical condition, such as that of endocarditis, be present, or if mania has developed, the pregnancy should be terminated at once.

Catalepsy. Catalepsy is one of the rare affections of the nervous system which may complicate pregnancy. In the few recorded cases the fœtus has been affected and has reproduced the peculiar coma and attitude of the mother.

Neuritis. Neuritis in pregnant patients is often the result of poisons, metallic dyestuffs, or tobacco. Excessively nervous patients suffering from nausea and vomiting also develop neuritis. In order to diagnosticate this condition it is necessary carefully to eliminate visceral disease, as most cases of nausea and vomiting can be referred to a pathological condition of some important viscus. In cases of multiple neuritis attended with nausea and vomiting the phrenic nerves have been found in a condition of marked degeneration, which may afford some explanation of the persistence of the nausea and vomiting.

Diabetes. This disorder, naturally referred to the nervous system and also to the assimilation of the patient, is rare in pregnancy. In 439 reported cases but three were found among pregnant women.

Pregnant patients suffering from diabetes present the usual phenomena of the disease. There is an excessive amount of urine secreted, the tongue is often dry and brown, and the breath has a peculiar odor, and discolored and purplish areas may be detected upon the skin. The amniotic liquid is abundant and is found to contain large amounts of albumin and also sugar. Acetonuria is sometimes present and indicates a grave condition. Pregnant patients may be diabetic only during pregnancy, the disorder ceasing when pregnancy terminates, to recur again after a subsequent conception. In favorable cases, if a patient recovers after diabetes in one pregnancy, it does not follow that she will

inevitably become diabetic in a subsequent pregnancy. Diabetic patients are not often sterile by reason of the disease.

The prognosis for the child in pregnancy complicated by diabetes is grave. It is, in fact, so unfavorable that no hesitation should be felt in inducing labor as soon as the mother's interests demand it.

In diabetes mellitus the amniotic liquid has been found turbid, very abundant, and with a heavy, mawkish odor. The fœtus was stillborn, and in an infusion made from its epidermis traces of sugar were found. The liquor amnii also contained sugar in considerable quantities in this case.

As a result of the diabetes in some cases *pruritus* may seriously disturb the pregnant patient and affect her health and strength. The presence of pruritus should lead in all cases to an examination of the urine, when the presence of considerable amounts of sugar may explain the cause of the disorder and suggest its treatment. In diabetic patients pruritus is more often limited to the vulva and vagina, and these cases are greatly relieved by any treatment which lessens the amount of sugar in the urine. Where diabetes is not present local applications of bichloride of mercury 1 : 1000, followed by salt solution, or simple water, carbolic acid 3 to 5 per cent., tincture of iodine, glycerin and carbolic acid, are often employed. Cocaine may be used in patients not susceptible to its action. Electricity is sometimes efficacious ; one pole applied with a moist electrode upon the mucous membrane of the vulva. Strict cleanliness is essential and douches of antiseptic solutions of alkaline reaction are useful. Many patients find great comfort from whole or from sitz-baths. Starch and laudanum poultices, or lead-water and laudanum, relieve some cases. An ointment of belladonna, opium, and iodoform gives freedom from irritation to others. Nitrate of silver solution is sometimes pencilled over the mucous membrane, and is of service. In the majority of cases, however, frequent cleansing with unirritating antiseptics and attention to the patient's general health will be found sufficient to afford partial relief, if not a radical cure.

Mental and nervous disorders may complicate pregnancy and often occasion great suffering, and may seriously imperil the well-being of mother and child. Hysteria is aggravated by the pregnant condition, and so far from being a cure for chronic hysteria, it, on the contrary, makes it much worse. In very nervous patients who are deficient in self-control, but who have no systemic disease, pregnancy may act as a stimulus by improving appetite and assimilation and increasing vigor.

Apprehension which such patients often feel regarding their approaching confinement is best allayed by the assurances of the physician and by his thorough study and attentive treatment of the case during pregnancy. Such patients, as a rule, are not frightened by the physician's examinations, but are disposed to derive comfort from the fact that their case is thoroughly studied. Hysterical patients sometimes develop a dangerous form of frenzy, which becomes hystero-mania. Although such patients can usually be controlled and kept from serious injury, still their recovery is prolonged, and during labor injury to mother or child may result if maniacal movements are violent. In

cases which persistently refuse food forced feeding at regular intervals is necessary. Hystero-maniacal patients are especially dangerous to themselves and to others, because the sudden attacks of mania to which they are subjected often lead them to acts of violence against which they have no protection. As soon as a diagnosis of hystero-mania is made the patient must be kept very constantly under careful and competent observation.

Insanity greatly complicates pregnancy, and is always a factor to aggravate pre-existing disease, and may influence the patient's labor and her recovery. The prognosis will depend very much upon the question whether the insanity develops during the pregnant condition in a patient who has no hereditary taint and who has not previously been neurotic, or whether the condition of pregnancy occurring in a very nervous woman brings about an attack of acute mania; in the former, in women previously healthy, insanity is characterized by less violence, while the outlook is far better. On the contrary, in neurotic patients mania may become violent or melancholia may lead to repeated attempts at suicide, requiring strict watchfulness and constant care. In women who receive a severe mental shock during pregnancy and become insane the prognosis depends largely upon the general physical condition of the patient and the surroundings and care under which she is placed.

The diagnosis of insanity during pregnancy is made by excluding hysteria, delirium tremens, hystero-epilepsy, and mania from acute toxæmia. Many cases of mental disorder of minor degrees of severity will be found to depend upon toxæmia. In the latter the results of proper treatment are often excellent, the patient recovering very promptly and usually permanently.

In cases of acute insanity which follow mental shocks, if abortion does not occur the prognosis is better, because the mother is stimulated by her desire that the pregnancy should continue. It must be remembered that cases of toxæmia often pass into chronic nephritis, which, although prolonged, is fatal in its results. In highly neurotic individuals the insanity of pregnancy rarely terminates in recovery after labor. If improvement occurs, it is generally of a transient nature.

The treatment of insanity occurring during pregnancy is essentially that of this disorder in the non-pregnant. In view of the fact that many of these cases have a distinct and acute cause, they should be thoroughly examined to determine the exciting factor which produces them. Appropriate medical treatment directed to this cause will usually relieve the patient.

Whether the case be one susceptible of radical improvement under medical treatment or not, absolute rest, seclusion, constant and kindly watchfulness on the part of physicians and attendants, and often change of scene and climate are indicated.

Those about the patient should meet her apprehensions with cheerful encouragement. In cases in which tendency to suicide exists the patient should be so completely guarded that her personal safety is assured. It must not be forgotten that in all cases of insanity the nutrition of the nerves is profoundly deranged and that the patient should be carefully

and systematically fed as a cardinal part of her treatment. The prolonged use of sedatives should be avoided, because it results in interference with processes of assimilation and nutrition.

Nausea and Vomiting in Pregnancy.

Irritability of the stomach, manifested by nausea and vomiting, is one of the unpleasant consequences which has been considered by some as inevitable in this condition. That such, however, is not the case may be seen by reference to those patients who not only are not troubled with nausea, but whose appetite increases and whose nutrition is improved during pregnancy. If pregnant patients are thoroughly studied, it will be found that, in the vast majority of cases, some definite and exciting cause of nausea and vomiting exists besides the condition of pregnancy. In some the nervous system is poorly nourished, unstable, and unduly excited before the advent of gestation. In others malposition of the uterus, often complicated by the results of previous pelvic disease, serves as the exciting cause. Others suffer from deficient excretions or from some other systemic poison.

In some a brain-tumor or some obscure condition of viscera concerned in digestion may be found to have caused the complication. The physician should not admit that any pregnant patient must suffer serious inconvenience or impairment of nutrition or strength by reason of nausea and vomiting until he has thoroughly examined his patient and failed to find the exciting cause. Unless he be acquainted with the pathology of nausea and vomiting in other cases he cannot recognize dangerous symptoms sufficiently early to give his patient prompt assistance.

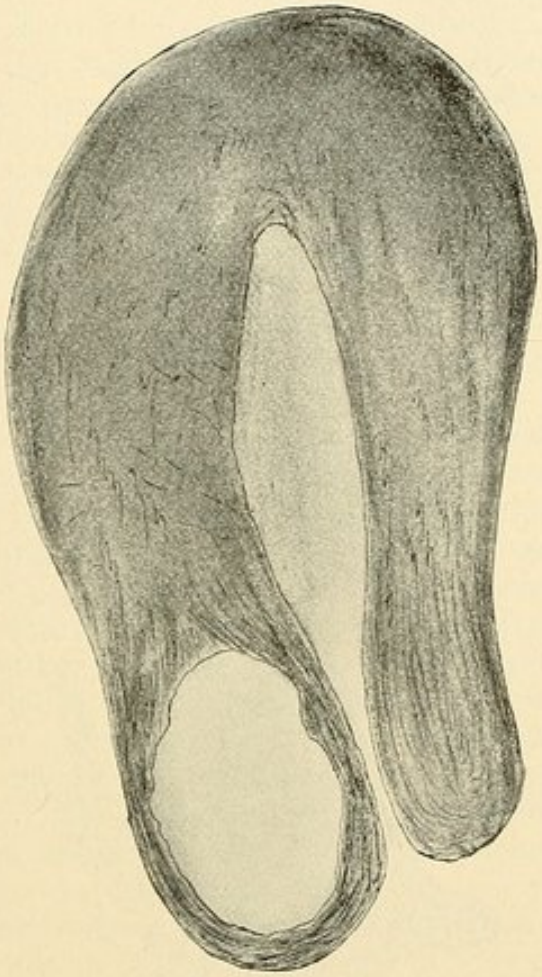
The predisposing cause of nausea and vomiting in pregnancy is most commonly irritability of the nervous system, which exaggerates reflex stimuli. It is most reasonable to suppose that the pressure of the growing womb upon the sympathetic nerves of the abdomen and upon the intestines causes a reflex irritation which results in emesis. In sound and healthy women this irritation produces so slight an effect that the patient suffers but little, if any, annoyance. Where the uterus is healthy and in its normal position, it is free to increase in size without seriously encroaching upon any important organ. The gradual distention of the healthy uterus by the growing embryo occasions little or no irritation to the mother when the predisposing cause of irritability of the nervous system is absent. The changes in the organism caused by pregnancy, great though they be, produce no marked disturbance in health in normal patients.

The exciting causes for these complications are those malpositions of the uterus which make it impossible for the womb to grow and develop naturally as pregnancy advances. The womb may be displaced backward, being low in the pelvis and beneath the promontory of the sacrum. It may be fastened in this position by adhesions or by exudates from previous pelvic disease.

In other cases the womb is bent sharply forward and carried downward and forward in the pelvis, becoming impacted behind the pubic

joint. In others congenital malformation of the uterus is present, as in uterus bicornis. The uterus itself may be abnormal in its shape and structure, as in cases where the cervix is abnormally thick and long and the seat of pathological processes. Other exciting causes of this complication are sudden shocks to the nervous system, direct mechanical injury, auto-infection, poisons, either metallic or poisonous germs, in some cases malaria or the product of the tubercle-bacillus.

FIG. 50.



Vertical section of uterus, showing cyst in posterior wall of cervix.

As far as age is concerned, these cases may be met with at any age of childbearing life and in women in any condition of society.

Primigravidæ are much more frequently affected by this complication than women who have repeatedly borne children. The explanation for this fact is found in the frequency with which malpositions and deficient development of the uterus occur in these women. As a rule, healthy working-women are much less often annoyed by gestation-nausea than are those who do but little physical work and whose muscular systems are poorly developed. The fact that the poor woman has but little time in which to think of her ailments, and hence is too busy with her daily work to indulge in nausea and vomiting, illustrates well the strong influence which mental states have in producing this complication.

The symptoms of nausea and vomiting in pregnant women are a

feeling of nausea as soon as the patient rises from her pillow, followed by sickness, which is often relieved by the ejection of a small quantity of watery mucus.

In other cases nothing is vomited, but the patient simply makes the effort and is relieved thereby. If she lie quietly for an hour or so, the nausea does not return; other patients are relieved by taking a small quantity of food while in the recumbent position. Where this desire

FIG. 51.

Dense connective tissue in cyst-wall.

becomes pronounced the patient cannot see food nor smell it, nor even hear it described without experiencing marked nausea. In aggravated cases the taking of a mouthful of anything into the stomach produces violent vomiting with the sensation of intense nausea; in extreme cases this sensation is accompanied by great prostation; the body rapidly wastes; the patient has no refreshing sleep; the matter vomited consists of mucus streaked with coffee-grounds. The mouth becomes dry and excessively foul; sordes gather upon the teeth; the patient complains of severe pain beneath the sternum, while the ejecta are grumous coffee-ground material, and in some instances blood. The pulse is

continuously over one hundred; the heart-sounds are feeble, muffled, and rapid; purpuric spots appear upon the body; the urine is highly colored, showing the presence of blood, while tarry stools may be passed from the intestines.

The diagnosis of pernicious nausea and vomiting is not so easy a matter as one might suppose. The experienced physician will rarely rely upon the statement of the patient as to the amount of food taken, or the number of hours of sleep obtained, or for important information in the given case. Periods of nausea and vomiting lasting but a few hours may pass so gradually into serious prostration that the patient may not realize her condition, while the physician, relying upon her statement, seldom appreciates the gravity of her situation. As soon as the physician finds by careful questioning that the patient cannot eat at least two full meals daily he should require that an accurate record be kept of the amount and sort of nourishment taken; but a few days' observation will show him that his patient is insufficiently nourished, and hence must be losing strength. To make an accurate diagnosis of this condition he must also examine carefully the discharges from the stomach and other organs of the body, remembering that this complication proves serious by causing acute anæmia. He will recognize in coffee-ground material disintegrated blood-corpuscles, which indicate a disorganized state of the blood. The same is true in cases in which the urine shows the presence of hæmatin or in which tarry matter from the intestines points to the existence of intestinal hemorrhage.

As soon as the physician appreciates that nausea and vomiting are interfering with the nutrition of his patient he should at once make a thorough examination of the genital tract to ascertain the presence or absence of any condition about the uterus or pelvic organs which may be the cause of the complication. This examination should precede the use of drugs to allay the symptoms. Many a patient has taken drugs to no purpose, and has gradually fallen into a condition of fatal anæmia without even an examination by her physician, who might have detected a condition in the pelvis causing the complication. In addition to pelvic examination, a thorough examination should be made to determine the condition of the viscera of the body and of the nervous system. In most cases such an examination will disclose the cause of the disorder and the question of treatment will be naturally solved by the results of such investigation. Where patients refuse to submit to a thorough examination it is far better for the physician to decline to accept the responsibility of their care, and to retire from the case, rather than be led to temporize and waste valuable time in the fruitless employment of ineffective treatment.

The treatment of these cases is rendered difficult by a common erroneous belief that nausea and vomiting inevitably occur in nearly all cases of pregnancy, and that they need no treatment and form a condition of no gravity. This is one of several ancient errors in obstetrics which has cost the life of many patients. On the contrary, there are few conditions more difficult to treat, and few patients whose care requires such thorough study and careful weighing of indications as in these cases.

The treatment should be first local, and second general. The local treatment must be addressed first to the uterus and then to any portion of the body which may be found in a pathological condition. When the uterus is not freely movable and either displaced backward or forward, it should be gradually raised in the pelvis and brought as nearly as possible to its normal position. If no adhesions or pelvic exudates are present, this may be readily effected by the use of tampons made of finely carded wool smeared with an ointment as follows :

Powdered boric acid	grs. 10.
Lanolin	℥ss.
Cosmolin	℥ss.

These tampons may be made of different shapes and sizes, according to the condition of the part. They are best inserted with the patient lying upon her side, the perineum being drawn backward by a Sims speculum. They may be retained for several days, or even longer if vaginal irrigation with antiseptic solutions be practised.

FIG. 52.

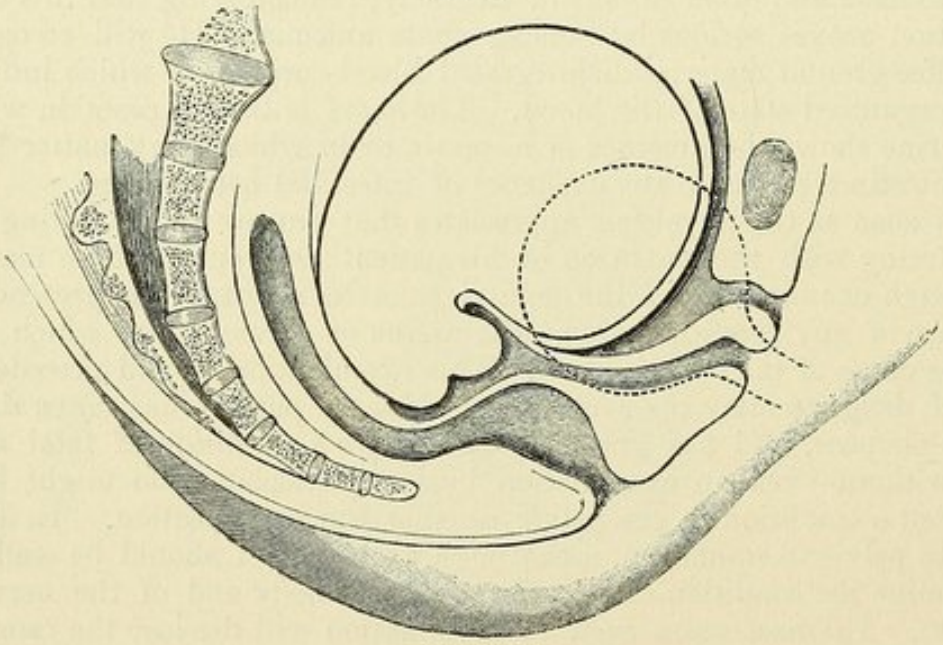


Diagram of a supposed section of pelvis with an anteflexed impacted gravid uterus at about three and a half months. Dotted outline indicates air-ball pessary's position. (See next figure.) (HEWITT.)

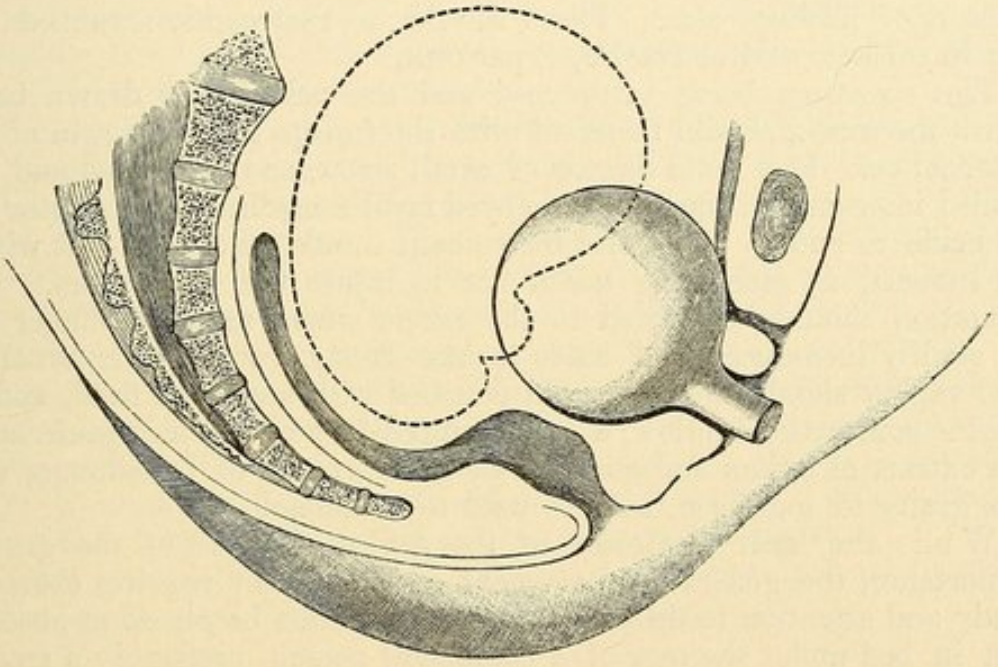
In cases where exudates or adhesions are present a strip of surgeon's lint three feet long and three inches wide may be sterilized and soaked in glycerin. If a condition of excessive irritability of the uterus be found, tincture of belladonna may be added to the glycerin, two teaspoonfuls to the ounce. This strip of lint should be gently but thoroughly packed about and beneath the uterus, distending the cervix, the pelvic floor, and carrying the uterus up into the pelvis. The result will be a copious flow of mucus, which will lessen the congestion and irritation of the cervix and surrounding tissue.

In cases where the uterus is forced downward and forward in the

pelvis against the pubic joint an air-ball pessary may prove of decided service. This may be introduced and inflated to a degree where its presence becomes distinctly felt by the patient without making painful pressure. But a very slight elevation of the uterus is necessary in many of these cases to secure marked relief. The pessary may be retained several days, and then removed and cleansed and reinserted and distended to a greater degree.

In cases of obstinate retroversion, when the uterus has been dislodged from the hollow of the sacrum, many patients can wear a rubber retroversion pessary to advantage. The posterior bar of such a pessary should be soft and larger than the others; and where such an instrument cannot be readily obtained, an ordinary Hodge pessary may be taken, its posterior bar cut off, and a piece of rubber drainage-tube slipped upon the cut ends. This gives an elastic bar which can be tolerated when the ordinary pessary cannot. When, however, the uterus is so sensitive that the slightest effort at local treatment or manipulation gives pain and increased vomiting, the patient should be given

FIG. 53.



Representing alteration supposed to be effected in position of uterus in foregoing figure by the action of the air-ball pessary. The alteration is represented by the dotted outline. (HEWITT.)

chloroform and the support fitted under anæsthesia. In replacing the retroverted pregnant uterus the knee-chest posture should be remembered as a most valuable aid. If complete relaxation of the tissues is desired, the patient can be partially anæsthetized, placed in this position, and the reposition of the uterus effected. Before the patient completely recovers from the anæsthetic a suitable tampon or support should be fitted. In some cases this posture alone may result in the spontaneous replacement of the pregnant womb. The patient can be instructed to assume this posture for fifteen or twenty minutes, night and morning, lying upon her side during the day with her hips considerably

raised. In this manner the uterus may gradually assume its proper position without manual assistance.

In a great majority of cases such treatment is sufficient generally to improve the patient's condition. If, however, there be present a very dense and resisting cervix, with a tightly closed os, it may be necessary to dilate the os to the extent of admitting the tip of the index-finger. This method of treatment, accidentally discovered by Copeman, requires anæsthesia by chloroform and strict surgical antisepsis. The finger is the best instrument if it can be inserted within the external os. In many cases this is impossible, and recourse must be had to the bladed or solid dilators; of these the solid is the best. The patient should be placed upon her back or side and under complete anæsthesia, the vagina thoroughly douched with tincture of green soap and creolin, one teaspoonful of creolin and one-half ounce tincture of green soap to a pint of warm water. The operator should scrub his hands thoroughly and use a solution of bichloride of mercury, 1 : 2000, followed by washing in alcohol. The linen and towels about the patient should be thoroughly aseptic. The instruments required are a Sims speculum, tenaculum forceps, a bladed dilator, and several steel solid dilators of medium size. These should be thoroughly scrubbed and put in carbolic acid or creolin, 2 per cent.

The speculum being introduced and the pelvic floor drawn backward, the cervix should be seized with the forceps at the margin of the external os. If a solid dilator of small size cannot be introduced, the bladed instrument should be employed until a medium solid dilator can be made to enter. The solid instrument should be carried just within the internal os, care being taken not to injure the membranes. The dilatation should be carried to the extent where the index-finger can be readily introduced and made to pass freely around the internal os. The vagina should then be again douched with antiseptic fluid, and, if uterine contractions follow, a rectal suppository of one-half grain aqueous extract of opium and one-quarter grain extract of belladonna, with five grains of iodoform, may be used to advantage.

While the local treatment of the genital tract is of the gravest importance, the general management of the patient requires thorough study and attention to details. The patient must be placed at absolute rest in bed under the care of a competent person, preferably a trained nurse. All external sources of excitement or irritation should be absolutely banished. Nothing should be said to the patient about nausea or food. The patient should not be expected to vomit, nor should she be given a basin to be held in readiness. Her head should, preferably, be low, and in some cases marked benefit has followed by resting the hips considerably higher than the shoulders. The reason for such improvement is probably found in the fact that in cases in which the uterus has been anteflexed and forced downward and forward such a posture aids to carry the uterus up and out of the pelvis. As these patients have often a body-temperature less than normal they should be kept warm in bed. Woollen should be next to the skin and hot bottles used, if needed, about the feet and legs. In some cases a flannel bandage pinned securely about the abdomen and over the stomach is

of service, although undue pressure forces the uterus downward and is injurious. Counter-irritation over the pit of the stomach is useful, and especially mild applications, which can be retained for some time.

In preparing such applications turpentine stupes may be preferred, because they can be used repeatedly with but very little irritation of the skin. Flannel wrung out of either hot or cold water, as is more agreeable to the patient, sprinkled with not more than a teaspoonful of spirits of turpentine, and placed over the epigastric region is excellent. A dry flannel should be put on in addition. Unless the patient be extraordinarily sensitive, this will not create a painful irritation and can be borne for some time. Mustard-plasters may be made so much diluted with egg or with meal or flour that the effect is a very gentle one, and may be long continued. Such a plaster should be spread upon muslin, and care be taken that a warm flannel is placed above it. Where the skin is very sensitive a hot rubber bag will be found very serviceable. In many cases a better result is obtained where the persistent use of this simple application is continued than by any form of irritant.

While some patients require a darkened room, most do best with free air and sunshine. The skin should be kept in good condition by daily sponging with alcohol and water or ammonia and water. This should be as hot as the patient can endure.

The question of feeding these patients is a most serious one, and will try the patience of the most experienced. If the stomach will retain nothing, the patient should be given nothing by mouth, but be nourished by rectal injections. These should contain meat-extracts, eggs, peptonized milk, with brandy in accordance with formulæ appended.[1] The following nutritive enemata have been found useful. Before administering such an injection the rectum should be washed out unless the bowels have recently moved freely. In giving these enemata a rectal tube attached to a funnel is needed, or a syringe having a hollow rubber ball. The temperature of the material injected should be 100° F., and the injection should be made slowly. Many patients retain such injections better when turned upon the left side.

After giving the enema the patient should be urged not to strain, and a folded towel may be held gently over the anus.

1.	Beef-tea	oz. 3.
	Yolk of 1 raw egg.	
	Brandy	oz. ½.
	Liquor pancreaticus	drachms 2.
2.	1 whole raw egg.	
	Table salt	grs. 15.
	Peptonized milk	oz. 3.
	Brandy	oz. ½.
3.	Beef-tea	oz. 2.
	Brandy	oz. ½.
	Cream	oz. ½.
4.	Beef-tea	oz. 2.
	1 whole raw egg.	

[1] The writer is indebted for these formulæ to Miss M. E. Smith, Chief Nurse of the Philadelphia Hospital.

5. Beef-juice . . . . . oz. 1.

6. Beef-essence . . . . . oz. 6.

7. Whites of 2 raw eggs.
Peptonized milk . . . . . oz. 2.
2 eggs.

Nutritive enemata are better retained if not more than four ounces are injected at a time.

The patient's thirst may be allayed by transfusion with a normal saline solution or rectal injection of the same. In desperate cases the heart's action must be maintained by strychnine, digitalis, or atropine, given hypodermatically. When a trial is made of feeding by the stomach it is well to begin with a teaspoonful of barley-water or white of egg and barley-water, given every hour for several hours, without stopping the rectal injections. When this is retained the quantity may be increased to a tablespoonful, and this may be substituted by a teaspoonful of beef-juice or a tablespoonful of freshly made chicken-broth.

Among the many excellent recipes the following are recommended by Starr in the preparation of barley-water, beef-juice, chicken-, mutton-, and beef-broth:

Barley-water:

Put two teaspoonfuls of washed pearl barley in a saucepan with a pint of water; boil slowly down to two-thirds of a pint; strain.

Raw beef-juice:

Take one pound of sirloin of beef, warm it in a broiler before a quick fire, cut into cubes of about one-quarter of an inch, place in a lemon-squeezer or a meat-press and forcibly express the juice; remove the fat that rises to the surface after cooling. *Never actually cook the meat.*

Chicken-broth:

A small chicken or half of a large fowl, thoroughly cleaned and with all the skin and fat removed, is to be chopped, bones and all, into small pieces; put them, with salt, into a saucepan and add a quart of boiling water; cover closely and simmer over a slow fire for two hours; after removing, allow to stand, still covered, for an hour; then strain through a sieve.

Mutton-broth:

Add one pound of loin of mutton to three pints of water; boil gently until very tender, adding a little salt; strain into a basin, and, when cold, skim off fat. Warm when serving.

Beef-broth:

Mince one pound of lean beef, put it, with its juice, into an earthen vessel containing a pint of water at 85° F., and let it stand for one hour; strain through stout muslin, squeezing all juice from the meat; place this liquid on the fire, and, while stirring briskly, slowly heat just to the boiling-point; then remove at once and season with salt.

It is well to feed by the stomach at the hours of dinner and lunch, continuing rectal feeding during the night and morning. As soon as

the patient can take an ounce of broth she will usually enjoy a little stale bread soaked in the broth or livers of one or two raw oysters or part of an egg beaten up with milk or brandy. The patient should not be asked whether she desires food nor should she know what is to be given her, nor should food be kept where she can see or smell it.

An accurate record is to be kept of every detail about the patient, and especially of the amount of food taken and the hours of sleep. As a rule, hot liquids will prove more stimulating and beneficial than cold, although the patient's frequent requests for ice could easily lead to an error by inducing the nurse to overload and depress the stomach by the accumulation within it of melted ice. When solid food is admitted, it should be preferably the livers of raw oysters, scraped-beef sandwiches, white meat of cold chicken, junket, or poached egg. Milk is a dangerous article to use, because the curd may accumulate in the stomach until its ejection by a severe fit of vomiting.

The treatment of these cases by drugs addressed to the stomach is most unsatisfactory and generally useless. There are few drugs in common use which have not been given in these cases with entire disregard of the condition of the pelvic organs and with no benefit. Lavage of the stomach has been employed in some cases with advantage. The galvanic current of electricity may be applied along the spine and one pole placed over the epigastrium with some benefit. In producing mild stimulation, hypnotism has been tried in nervous patients with temporary advantage. The free and indiscriminate use of opium is injurious as tending to derange secretion and digestion.

It is interesting to note how many cases yield to the methods of treatment described and go on to recovery while the pregnancy continues. Unless, however, the physician can control his patient, she may gradually pass into a condition of rapidly increasing anæmia which speedily proves fatal. Before extreme prostration, pain beneath the sternum, and coffee-ground vomiting supervene, the physician must promptly interfere in the interests of the mother. There can be no question about his duty in the case when proper treatment addressed to the uterus, systematic feeding, and skilful nursing fail. The danger lies in operating too late, not in the operation itself.

To empty the uterus in these cases the physician requires a Sims speculum, a bladed dilator, solid dilators of medium and large size, tenaculum forceps, a uterine curette, and a fountain-syringe. The patient may be anæsthetized with chloroform and placed in proper position. The bladder and rectum must be emptied. The vagina is thoroughly cleansed with green soap and creolin. The field of operation is surrounded with clean linen, the hands and instruments of the operator being aseptic; the cervix is dilated to the extent of the largest solid dilator. The embryo and its appendages are then removed by the finger of the operator; the uterus is thoroughly emptied and douched by the uterine curette. It is then packed with gauze and carried up into the pelvis and the vagina tamponed with antiseptic gauze. The gauze should be removed from the vagina in twenty-four hours and an antiseptic vaginal douche given. The gauze should be removed from the uterus in forty-eight hours and vaginal douches continued for a

week. If no grave alteration in the patient's vital organs is present, and the case is taken early before strength is lost, recovery will ensue; if, however, some grave lesion outside the uterus is causing vomiting, the temporary improvement will be followed by a relapse and death.

Cases of obstinate vomiting may occur in women in whom pregnancy is present but not suspected; such are exceedingly perplexing in diagnosis, and the examination of such a patient cannot be complete without a thorough pelvic examination. The physician can take nothing for granted in these cases, nor should the patient's character or social condition mislead him.

Should the patient recover and complete her pregnancy, she is naturally interested to know whether she must expect such a complication in a subsequent pregnancy. As a rule, she may expect to escape with less suffering, especially if attention is paid to the position of the uterus and to the condition of the pelvic organs.

Many cases of nausea and vomiting during early pregnancy are gradually improved and cured by the use of wool tampons, which the physician can fit and supply at his office. While this will necessitate frequent care for the first few months of pregnancy, patients are often so greatly relieved that they cheerfully submit to the inconvenience of office-visits. There remain a few recorded fatal cases in which a diseased condition of the uterine decidua has been found. That this condition is the cause of nausea and vomiting is not proved as yet. Efforts have been made to find diseased conditions of the embryo and its appendages which cause fatal nausea. There exists, however, no direct proof that disease of the fœtus precedes obstinate nausea and vomiting in the mother. Recent efforts have been made to find a cause for this condition in an infective process.

While post-mortem examinations in some of these cases show evidence of general infection, the active germ or agent has not been isolated, and these cases remain as yet unexplained. Toxæmia and ptomaïne-poisoning undoubtedly cause many cases of nausea and vomiting. In examining such patients the condition of the organs of elimination must be thoroughly studied and care taken to relieve the patient of such an abnormal condition.

One of the most annoying complications of pregnancy, allied in many respects to nausea and vomiting, is **ptyalism**; the exact cause of this condition is not definitely known. It seems most reasonable to consider it as a nervous affection, especially as sedatives addressed to the nervous system are most successful in treating the disorder. The flow of saliva is excessive in these cases, and is sometimes accompanied by a thick, tenacious mucus, which is most annoying to the patient. These cases are sometimes observed in patients whose digestion is disordered and who labor under abnormal appetites. General anasarca and widespread œdema are sometimes seen in these cases.

So far as treatment is concerned, the use of mild alkaline antiseptic gargles is often of great benefit. Such are tincture of myrrh, weak solutions of boric acid or of carbolic acid or thymol. The use of electricity has been successful in some cases. The current to be employed should be the galvanic, the dose being from two and one-half to five

milliampères, employed for from seven to ten minutes, the current being passed through the parotid and salivary glands.

Enlargements of the abdomen may complicate and disguise pregnancy in cases in which tumors interfere with the circulation of blood or lymph in the peritoneal cavity, and gradually cause ascites. It is evident that pregnancy complicated by an abdominal tumor might be rendered exceedingly obscure by localized or encysted dropsy. Tubercular infection of the peritoneal sac may also cause dropsy and may develop rapidly during gestation. In many cases in which the dropsy becomes sufficiently great to cause suffering abdominal section and drainage are indicated. If the case be tubercular, the prognosis for recovery will be greatly improved by the operation. In any event the patient's condition will be temporarily improved.

Phantom pregnancy not infrequently occurs, and has occasioned much study. Its cause will be found in some pathological condition which produces constant abnormal irritation of the abdominal sympathetic nervous system. Thus, a patient with dropsy may imagine herself pregnant because of the enlargement of the abdomen. In other cases neurotic women who desire children are often led to believe that the pregnant condition exists, from some chronic disease of the sympathetic nerves of the abdomen. This curious phenomenon is rarely met with except in nervous women. The diagnosis is to be made with thorough examination, if necessary, under anæsthesia. In disputed cases it is well to have a friend or relative of the patient present to witness the disappearance of the abdominal tumor as the patient passes under the anæsthetic.

Disorders of the liver in pregnant patients may be of a mild and not serious form or may result from fatal infection. Retained fæces, catarrh of the bile-ducts, obstruction to the flow of bile, or pressure of the uterus upon the bile-ducts may result in jaundice. The intestines are deficient in action in these cases, while the kidneys often show in the urine the condition of hæmatogenic jaundice. Obstinate jaundice may follow malarial intoxication, which may terminate with great gastric disturbance and vomiting, with premature labor. The treatment of simple jaundice during pregnancy is essentially that of this condition in the non-pregnant. The prognosis is in mild cases good.

Acute yellow atrophy of the liver is an infectious disease of uncertain origin. It is comparatively rare. Its symptoms are profound jaundice with fever and the absorption of septic material. Liver-dulness is first increased, later diminished in area. The stage of incubation lasts usually from three to five days, with gastric and intestinal catarrh, followed by chills, distress referred to the brain and cord, with elevation of temperature. Pressure over the abdomen and over the liver may elicit complaint of great suffering, while the urine is loaded with albumin. Death may occur before delivery, as such patients usually abort or have premature labor. The amniotic fluid and the fœtus itself and membranes may be stained a bright yellow in fatal cases. The child is usually stillborn; these patients die with high fever in septic coma.

The infective germ of this disease has not been isolated, and we are

in ignorance of the exact cause of this most fatal disorder. It is commonly seen in patients living in filth and surroundings favorable for the rapid development of bacteria. The prognosis in these cases is usually fatal, and all that can be done in treatment is to purge the patient promptly and give stimulants freely.

Gastric ulcer may complicate pregnancy and produce its characteristic symptoms in the vomiting of blood and abdominal distress. The gravity of this complication depends upon the amount of blood lost. In cases where the mother rallies and the vomiting of blood ceases the prognosis for the child is favorable if a large amount of the blood is not lost. On the other hand, where bleeding occurs to the point of collapse the fœtus is usually stillborn.

Appendicitis during pregnancy may seriously complicate this condition and threaten the life of the mother. Premature labor is very apt to occur, and should the case require an operation the appendix may be found as high in the abdomen as the lower end of the kidney, as it is carried upward by the pregnant uterus. The mortality of appendicitis in pregnancy, while higher than that of the non-pregnant, is still not so high as to forbid operation.

Early removal of the appendix is especially indicated in these cases, to remove a septic focus which might easily cause peritonitis in tissue made hyperæmic by pregnancy.

Albuminuria and peptonuria may occur during pregnancy. A better knowledge of the excretory processes teaches us that little weight attaches to the first condition, so far as serum-albumin in the urine is concerned. Different observers have found serum-albumin in from 2 to 18 per cent. of pregnant women and in 60 per cent. of those recently delivered. In a considerable number of patients dying with serum-albumin in the urine post-mortem examinations fail to reveal the presence of nephritis. In fact, so common is albuminuria in these patients that some consider it as a diagnostic sign of pregnancy. It is only when albumin is present in large amounts and accompanied by tube-casts that its presence is significant.

Peptone is a frequent constituent of the urine in pregnancy whose presence has no pathological meaning of importance. Although it has been found after complicated labors where the fœtus was macerated, it cannot be considered an accurate sign of disease either in mother or child.

The treatment of albuminuria and of peptonuria consists first in a careful regulation of the patient's diet in accordance with the indications and methods already given. The element of fatigue is a most important one in bringing about loss of serum-albumin through the kidney. Such patients should be made to rest and to assume the recumbent posture during as long a time as circumstances will permit. If complete rest is impossible, the patient may be able to retire from active work for several hours during the day. Where a change of scene and removal from responsibilities for the time can be effected, it is a most valuable aid in treatment. Care should be taken that no cause for congestion about the abdominal viscera is allowed to continue. The hygiene of the patient in the matter of clothing, excretion, exercise,

and the securing of a proper temperature must be carefully looked after. An examination of the blood will be a useful adjunct and give information of value as to the patient's nutrition. Many women do well by taking iron in this condition, while with others the stomach is disturbed by iron, and arsenic is preferable. Among the preparations of iron which are often useful the mixture of the acetate of iron and ammonium, known as Basham's mixture, often serves a useful purpose. For patients with sensitive stomachs the citrate of iron and manganese, or the pepto-manganate of iron, may be used to advantage. While exclusively milk-diet is sometimes indicated, it is usually impossible to continue this restricted nourishment without exciting disgust. While milk is a useful food for these patients, they can usually take the diet recommended in toxæmic conditions with advantage. Serum-albumin during pregnancy must be considered as evidence of nervous tire or inefficient assimilation. It has no bearing upon a condition of toxæmia, and, if rest and proper food be given, the parenchyma of the kidneys remaining free from extensive pathological change, it is rarely an important factor.

The occurrence of peptones in the urine is of unknown significance. It does not necessarily point to fœtal disease nor to any one pathological process in the mother. Its presence, however, calls for a thorough examination of the mother, to be sure that her processes of assimilation and excretion are as perfect as possible.

The **mouth and teeth** may become diseased as an indirect consequence of pregnancy. The gums are sometimes soft, and a deposit known as white caries forms about the teeth. The margins of the gums are thin and pale and retracted. Along the edges of the gum there is a ridge darker in color than the surrounding tissue. In some cases the gums are red, and around the neck of the tooth pus escapes. This condition is caused by a change in the fluids present in the mouth. The salivary glands act more freely than normal, but rarely to the extent of ptyalism. The secretions of the mouth are changed in reaction, losing their alkalinity, and are thus able to attack the teeth. The teeth are often affected by brown caries, making them dark in color, with cavities whose edges are black. A line of brown is often seen upon the upper teeth, while the enamel is dark. This form of caries generally begins in the upper jaw and attacks those teeth which are most exposed to fluids ejected from the stomach. At times much of the jaw is absorbed and the teeth are loosened in their sockets.

While many of these cases are observed among the poor, well-nourished women may also suffer in this way. This disorder emphasizes the need for proper care of the teeth during pregnancy. The dentist should be early consulted, as toothache to a patient in the pregnant condition is most distressing and depressing. The nerves of the face supplying the teeth are sometimes affected during pregnancy, giving rise to obstinate neuralgia. In most of the cases bad teeth will be found the cause, and when these are removed or filled the pain ceases. Occasionally pain in the mouth or teeth is entirely reflex, the cause being found in some affection of the uterus.

The part which bacteria play in producing caries of the teeth must

be remembered, and mouth-washes and sprays of mild antiseptics should be frequently employed. Of these the following is a useful solution:

Sodium biborate	grs. 60.
Glycerin	℥ ½.
Water to make 6 oz.	

To be used as mouth-wash or spray.

Thymol, 1 : 2000, is always a very useful application in these cases. To alter the secretions of the mouth, very dilute lemon-juice and glycerin form a very agreeable application, and if applied to the mucous membrane, and not to the teeth, often serve a good purpose. The patient may be instructed to drink as freely as possible of mildly alkaline waters. Acid articles of food should be avoided as much as possible, starches should be limited in quantity, while meat and green vegetables form the most useful articles of diet.

Alcohol and collodion may be painted over the gum around a single tooth. When it is necessary to fill teeth in pregnancy it should be done with as little pain as possible. When it is necessary to extract a tooth in these cases there should be no hesitation in giving the patient gas to avoid distress. Severe pain in the teeth is most depressing to pregnant patients, and may influence the development of the child unfavorably.

The **thyroid gland** may develop so rapidly in pregnancy as to form a goitre and seriously affect respiration. Where the patient's circulation is affected premature separation of the placenta with fœtal death may occur. Progressive loss of flesh, very rapid heart-action, and greatly disturbed nervous system accompany this condition, and may bring about a state of great exhaustion. In the treatment of these patients operation must be promptly undertaken if the condition becomes grave.

The **blood of the pregnant woman** is at first anæmic, but soon becomes richer in corpuscles and fibrin than in the non-pregnant. Hæmoglobin increases with the growth of the corpuscles. The specific gravity of the blood in the pregnant condition is 1025.

Observations agree in showing that **anæmia** during pregnancy is distinctly pathological and exceptional. The causes of anæmia in the pregnant condition are the same as in the non-pregnant. Lack of nourishment, bad surroundings, overwork, a loss of blood, and any depressing cause which affects assimilation may produce this condition. It is to be recognized by studying the blood after the methods employed so successfully at present. In some cases a family history of leucæmia is found, while in others a syphilitic taint causes the anæmia. As pregnancy goes on these patients often show dangerous symptoms, such as nose-bleeding, vomiting of blood, and extravasation of blood beneath the skin.

In treating the anæmia of pregnancy it is first of great importance that accurate diagnosis of the variety of anæmia present should be made by microscopic examination of the blood. This, combined with a thorough physical examination of the patient and the careful study of her excretions, should give the physician a clue for his treatment.

Thus, if toxæmia be present, it will be manifestly useless to give the patient iron or arsenic until the assimilating organs are brought into a proper condition to utilize these substances. If the blood be found poisoned by bacteria, or if malaria be present, this must be remedied before the anæmia can be successfully removed. It may be possible that tubercle or some infected condition of the birth-canal is the primary cause of the anæmia. If the fœtus has perished and is retained, its decomposition interferes seriously with the assimilation of the mother. In this case the patient will manifestly be no better until the uterus is emptied and the absorption of the products of decomposition has ceased.

When, however, the cause of the anæmia has been removed, very much can be done to hasten the return of the patient to a condition of health. Observation has shown that arsenic is especially valuable in the various forms of anæmia in pregnant patients. It should be given in the form of Fowler's solution, one drop three times daily, with food, and diluted with not less than two ounces of water. This dose may be gradually increased, a drop being added to each third dose until the patient is taking five or six drops three times daily. As the dose increases care must be observed to increase the amount of water taken in like proportion. In patients with whom arsenic in this form does not agree it is sometimes possible to use arseniate of sodium in capsules or pills.

In selecting a preparation of iron for these cases, that should be chosen which shall be best assimilated and least likely to cause constipation. The citrate of iron, the citrate of iron and manganese, the pepto-manganate, the dried sulphate, and, with some patients, the tincture of the chloride of iron, will each serve in various cases a useful purpose. A mistake is sometimes made in increasing the dose of iron too rapidly, the result being that the liver of the patient is disturbed and that her assimilation is interfered with. Small doses of bichloride of mercury of $\frac{1}{250}$ to $\frac{1}{100}$ of a grain may be taken two or three times daily with good effect upon the action of the liver and also the making of blood. In cases of anæmia in which neuralgia is a prominent symptom fats and oils and alcohol may be required until nutrition has become substantially improved. Cod-liver oil, olive oil, and the fat of beef and mutton and the marrow of beef-bones may be used to advantage. Marrow is best given as an article of diet by selecting proper bones, broiling them upon a quick, hot fire, serving the bones to the patient, and having the marrow removed from the bones just before it is eaten and placed upon freshly made hot toast. If it be sprinkled with salt, it makes an appetizing and useful dish. Care should be taken not to employ alcohol in diet with these cases any longer than can possibly be avoided. Whiskey well diluted may be used with meals for a short time only, provided it stimulates assimilation. It is especially useful in cases of anæmia complicated with neuralgia. In cases of extreme anæmia the patient should be very carefully fed small quantities of proper food at short intervals. Absolute rest in bed, artificial heat about the body, the inhalation of oxygen, and, in some cases, the injection of normal salt-solution, may be necessary.

Attention must be called to the fact that the belief that pregnancy brings about a condition of anæmia for the first month of gestation, and that this anæmia is a natural consequence of pregnancy, is not justified by accurate scientific investigation. In a perfectly healthy patient pregnancy does not always dispose to anæmia, but, on the contrary, induces a condition of plethora. When a pregnant woman fails to increase in physiological functions there is a pathological cause for this condition which should be sought for and removed. The failure to do this is one of the causes of failure in lactation, subinvolution of the uterus after labor, and slow and tedious recovery in the puerperal state.

Profound anæmia may pass into a hemorrhagic condition in pregnant patients, and purpura may develop. The absence of the previous history of blood-losses in these patients is very instructive and illustrates the difficulty of diagnosis. Privation and overwork may bring about this condition, while mental shocks sometimes cause it. Where the disorder is not severe the mother and child may recover. In severe cases both are lost from hemorrhages. There is evidence for and against the belief that germs produce this condition. Study of the blood has shown granules in the corpuscles. The red cells become much less and the white much greater than normal. Great diminution in hæmoglobin has also been observed.

The treatment of purpura in pregnancy requires the use of all agents addressed to the improvement of the blood. When the condition occurs with bleeding into the subcutaneous tissues the bleeding-points should be covered with antiseptic dressings. If syphilis is suspected, mercury should be given. The induction of labor is only useful when done very early, before the patient's strength has been lost.

A diseased condition of the heart is a serious complication of pregnancy, and may very gravely complicate labor. The gravity of this condition, as regards its influence upon labor, depends upon the sort of cardiac lesion which is present and the condition of the heart-muscle and of the lungs and other viscera. In patients who have but a slight aortic lesion, if they are placed under good hygienic conditions, pregnancy and labor may occur with but very little disturbance and very little embarrassment during parturition. The hypertrophy of the heart which pregnancy develops, and its vigorous action during labor, serve to carry the patient through her parturition with but very little increased strain. If her nutrition remains good during pregnancy, the heart-muscle will be found adequate to meet the varied conditions which gestation induces. If the bloodvessels of the body be healthy, and if the excretory organs are virtually intact, the patient may do well, although she has a cardiac lesion.

Mitral disease is more common among pregnant women, and is dangerous in proportion to its extent and also in proportion to the integrity or impaired condition of the important viscera of the body. The natural tendency of aortic and regurgitant lesions is to produce an engorged condition of the lungs, and this is favored by the condition of the circulation during labor. If the heart-muscle be weak, the increased strain of parturition may cause overdistention of the ventricles and

seriously threaten the patient by engorgement of the right heart, and asphyxia. Mitral stenosis is frequently observed among pregnant women, and is accompanied by palpitation, with characteristic pain and depression, and also with bronchial catarrh. In diagnosticating this condition it will be found of service to note carefully the interval between the pulse-beat and the cardiac systole. This can be obtained by listening carefully to the heart, while the finger of the observer studies the radial or some other terminal artery.

While endocarditis may occur in pregnant women from the same causes which produce it in others, there can be no doubt that frequent childbearing has an important influence in determining the occurrence of this complication. Should fresh infection arise, the condition of pregnancy militates very gravely against the recovery of the patient.

As soon as cardiac lesions become sufficiently pronounced during pregnancy to embarrass seriously the mother nature endeavors to rid her of the fœtus by abortion or premature labor. These cases are often complicated by considerable hemorrhage, and are very likely to develop an intercurrent pneumonia. These patients are also very liable to intercurrent pneumonia by reason of the chronic congestion at the lower portions of the lungs, and this disease is often exceedingly fatal among these cases. The pneumococcus is also found in the fœtus of patients having pneumonia, and may give rise to the same disease in the lungs of the child. In treating cases of pneumonia in pregnant women, complicated by heart-lesion, a most vigorous effort must be made to relieve the congestion at the base of the lung by cupping, counter-irritation, and by the use of remedies like digitalis and strychnine, which improve the heart's action.

In simple mitral insufficiency the mortality-rate need not rise higher than 13 per cent. When, however, the lesion is a complex one, with disease of the viscera as well, a death-rate of 50 per cent. is computed.

The treatment of a pregnant patient suffering from disease of the heart should consist in a strict regulation of the details of the patient's life. Any cause tending to produce pulmonary congestion must be carefully avoided. The bowels should be made to act regularly and the action of the heart stimulated and quieted by appropriate tonics. A mild climate is most desirable for these patients.

Nature frequently takes care of these cases by interrupting the pregnancy if symptoms of pulmonary engorgement become extreme. With some patients, however, the physician must take the initiative. In actual labor with these patients a moderate flow of blood should not be feared or avoided, because its removal from the circulation often has a beneficial effect, if only for a short time. Especial precautions must be taken to avoid septic infection, as such cases are especially liable to develop a severe and rapid form of sepsis if infection be present. The induction of labor should be practised only in cases where dilatation of the heart occurs rapidly and to a great extent and where the patient's strength is obviously failing. In this operation, the tendency of the parts to extreme congestion should be borne in mind, and a moderate flow of blood from the uterus should not be

checked, but rather encouraged as tending to relieve the condition of congestion which is so serious a factor.

As a rule, pregnancy complicated by heart-lesions should not be interrupted. Where dilatation of the ventricles has been excessive the patient is always exposed to danger of sudden death during pregnancy. During labor the strain thrown upon the heart may produce sudden and rapid dilatation. This condition is marked by very sharp and excruciating pain, by great breathlessness, and pronounced air-hunger. Unless relief is given by medication, the patient may perish during parturition. Should this happen and the heart-beats of the child still be audible, it is the duty of the physician to extract the child as soon as possible through the natural channel, if it be sufficiently dilated and the pelvis be not too small. In selected cases this procedure has given excellent results. Should the condition of the birth-canal be such that it would require considerable time to secure dilatation, this should not be waited for. Dilatation can be brought about by dividing the cervix with blunt-pointed scissors. The fœtus may then be rapidly extracted with the forceps, and often successfully. If the conditions are not favorable for this, it is better to open the abdomen to extract the child as rapidly as possible by the Cæsarean operation. As the fœtus is often in good condition in these cases, it may be possible to extract a living and healthy child.

The remarkable effect of anæsthetics must be noted in these cases. While the patient may be cyanosed and laboring greatly for respiration, the administration of an anæsthetic, so far from increasing the difficulty in breathing, seems often rapidly to relieve it. Chloroform sometimes relieves a patient's oppression in a remarkable manner and permits the rapid extraction of the fœtus, which may be followed by a marked improvement. Should pneumonia supervene the patient's chance for life is exceedingly dubious. But little can be done beyond free stimulation and supporting treatment. Every effort must be made to relieve congestion at the bases of the lungs and to further the active circulation of the blood. If the conditions indicate, free bleeding may be practised with great benefit.

Passive hemorrhage from various portions of the body may complicate pregnancy, and indicate a serious condition. Hemorrhage from the vagina may be the result of an abnormal position of the placenta, may come from the rupture of distended veins about the vulva or vagina, or, if the discharge be slight but persistent, may be caused by the congested and eroded condition of the *cervix uteri*. Hemorrhoids in pregnant patients are aggravated by the condition and may cause considerable hemorrhage. Varicose veins of the lower extremity occasionally burst during pregnancy, and the bleeding which follows is sometimes severe and may become dangerous. This condition of the veins is aggravated by obstinate constipation, by standing constantly, and by constriction of the legs by tight garters or improper clothing about the waist. In patients in whom varicose veins become aggravated, obstinate itching and great hyperæmia of the surrounding skin may cause considerable suffering. In these cases cold affusions with solutions of boric acid, with 1 per cent. carbolic acid, or with alcohol

and water, are useful. A supporting bandage is also indicated, and should preferably be made of flannel and applied from the foot to the groin. Bandages of rubber, or of rubber and silk, frequently increase the irritation from which the patient suffers. If distention of the veins is so severe as to threaten rupture, the patient should be given a compress of antiseptic gauze and a flannel bandage, and should be instructed, in the event of rupture, how to have these dressings properly applied. Cases are occasionally seen so severe that the patient is obliged to remain recumbent until the termination of pregnancy. A chronic enlargement of the veins naturally predisposes to thrombosis if the condition becomes aggravated and if the labor is a severe one. If the enlargements of the veins extend to the groin, the patient must be put to bed, the limb elevated, and every precaution taken to avoid, if possible, thrombosis after labor.

Passive bleeding may also occur during pregnancy, from the mucous membrane of the stomach, from dilated veins in the œsophagus, from the lungs, or from the mucous membrane of the nose and pharynx. Such hemorrhage, if moderate in amount, is usually an effort on the part of nature to relieve an abnormal congestion in that portion of the body. If persistent, however, it should cause a suspicion of tubercle in the lung, of gastric ulcer, or of a diseased condition of the liver which interferes with its circulation. Such a condition calls for a thorough physical examination of the patient and the employment of those remedies best adapted to the organ found to be at fault.

Some patients are especially liable to passive bleeding at those times when menstruation would have occurred had pregnancy not supervened. In some women the os and cervix become so congested at these times that considerable oozing of blood takes place. This has given rise to the mistaken belief that menstruation may persist during pregnancy. Women who suffer from chronic nephritis are especially liable to hemorrhage from the uterus during pregnancy. This arises from a diseased condition of the endometrium, which often terminates by the premature expulsion of its contents. Hemorrhage is also one of the results of profound infection, either with malaria or with any of the other active germs.

Acute Infections during Pregnancy.

The condition of pregnancy renders the body of the mother especially liable to infection, by reason of the hyperæmia of her tissues. The termination of pregnancy opens wounded surfaces which give access to infective germs. It is easy, then, to understand how infections occurring during pregnancy are especially severe in their results. The most common forms are those which enter the body through the genital tract.

Gonorrhœa during pregnancy, if severe and resulting from infection with recent virus, is characterized by the same symptoms which mark it in the non-pregnant patient. Difficulty in micturition and the presence of an irritating yellow, purulent vaginal discharge are the most common symptoms. In mild cases, and especially in cases where an old gonorrhœa has never been cured, the discharge may be simply

catarrhal and may arouse no suspicion until labor, when the development of purulent ophthalmia in the infant throws light upon the character of the mother's previous condition. In these cases, if examination be made, the attention of the physician may be attracted by the absence of active inflammation in the mucous membrane in the vagina. In examining the orifice of the urethra he will find exuding a thin, muco-purulent secretion which contains gonorrhœal poison. Many patients have gonorrhœa during pregnancy who are entirely ignorant of their condition. It is useless for the physician to question such patients regarding the presence or absence of gonorrhœa. It is always his duty, however, to interrogate every pregnant patient regarding the presence or absence of vaginal discharge. Patients understand best this question if they be asked not only whether they have a discharge, but also whether it is white, yellow, or red. If white and not staining the linen, it is the usual leucorrhœa of pregnancy. If, however, the linen be stained yellow, a new or old gonorrhœa must be suspected ; while if a thin, reddish and offensive discharge be present, cancer should be feared.

Acute gonorrhœa occurring during pregnancy should be treated as this infection is managed in the non-pregnant. The patient should be put to bed, the bowels thoroughly moved by salts, and restrictive diet, largely of gruel, ordered, while vigorous local treatment must be employed. This should consist in placing the patient upon her back across a table or bed and thoroughly douching the vagina with a quart of warm water containing an ounce of tincture of green soap or two quarts of castile soapsuds. The purpose of this cleansing douche is to remove the pus and mucus which cover the mucous membrane and harbor gonococci. To do this cleansing properly it may be necessary to use a rubber speculum ; often a round speculum is most convenient. The vagina should then be thoroughly irrigated with solution of bichloride of mercury, 1 : 1000. Absorbent cotton should be taken in a pair of forceps or wrapped upon an applicator, and the interior of the cervix thoroughly but gently cleansed with mercurial solution. When this has been done the urethra should be inspected and wiped out for an inch or more of its extent in the same manner. This must be followed by a douche of simple warm water. The vagina is then tamponed with gauze containing 50 per cent. of iodoform. The external parts should be thoroughly washed with soap and water, then rinsed with water and douched with bichloride solution of 1 : 1000. A dressing of bichloride gauze 1 : 2000 over the vulva is kept in position by a T-bandage. This thorough cleansing should be repeated daily until the disorder grows perceptibly better.

The greatest care must be taken to have the patient pass her urine without the use of a catheter, on account of the danger of infecting the bladder. As soon as the discharge ceases to be purulent and becomes mucoid the douche of mercurial solution should give place to creolin, 2 per cent., or carbolic acid, 2 per cent. Should cystitis occur, the bladder must be washed out two or three times in twenty-four hours with creolin, 1 per cent., or saturated solution of boric acid. It is also well in these cases to give the patient boric acid internally or salol if fever be present.

For the chronic gonorrhœa which is unsuspected by the patient, vaginal irrigation with creolin, 2 per cent., with tincture of green soap, may be carried on by the patient herself several times daily until the discharge ceases.

The following formulæ are useful in these cases :

Creolin or lysol	℥ 2.
Tincture green soap	℥ 4.

A tablespoonful in a quart of warm water as vaginal douche night and morning.

Where an irritable condition of the vaginal mucous membrane is present antiseptic suppositories may be used to advantage :

Iodol . . . }	
Powdered boric acid }	each ʒ 5.
Extract. belladonnæ	gr. 2.
Cocoa-butter, q. s.	

In 10 suppositories : one to be inserted after each douche.

The physician should examine his patient before labor to be sure that no poisonous discharge is present which may infect the eyes of the child. Occasionally pregnancy will be complicated by vulvo-vaginal abscess following gonorrhœa. These cases should be treated by operation under an anæsthetic, the operator not contenting himself with simply incising the abscess, but thoroughly curetting the abscess-sac, securely cleansing and packing it with iodoform-gauze.

Syphilis, when acquired during gestation, is often especially severe. The virulence of the infection deepnds not only upon the germs of syphilis, but also upon septic bacteria which frequently accompany the other. When infection occurs at conception, if septic germs are present the complication is most malignant, the disease assuming phases which may greatly perplex the physician. It is estimated that 5 per cent. of pregnant patients are syphilitic in the larger cities. Fournier states that a syphilitic woman who becomes pregnant is much more likely to abort than is a pregnant woman who becomes syphilitic. The mortality with the fœtus is greater also with syphilitic women who conceive than with those who had no syphilis before conception. The older the syphilis, provided it has not been treated, the worse the prognosis. The earlier the infection occurs the worse the prognosis for the continuance of pregnancy. If infection is acquired during the first four months of pregnancy, the fœtus commonly dies. 50 per cent. are lost from the fourth to the sixth month. The general fœtal mortality from maternal syphilis is 75 per cent. The mother's health is often greatly impaired by specific infection. The disease runs in many cases a most acute course.

Proper treatment should begin as soon as possible and be vigorously pursued. The biniodide and bichloride of mercury, calomel, gray powder, and the bichloride given by injections are all of use.

Hare advises the use of a quarter of a grain of the protiodide of mercury, in pill-form, three times daily, increasing the quantity by one pill every second day. When diarrhœa, fetid breath, or a slight tenderness of the gums occur, the dose may be reduced one-half, and, if this agrees with the patient, it may be continued for, if necessary, a

year or more. If local symptoms of syphilis arise, the amount must be increased. Where pain and purging follow, opium must be combined with mercury. Mucous patches are best treated by applications of solid nitrate of silver, or sulphate of copper, 20 per cent. chromic acid solution, or the acid nitrate of mercury. Mucous patches in the vagina or vulva are well treated by douches of bichloride solution, 1 : 2000, followed by dusting with calomel and bismuth. Where headache is obstinate, one-sixth of a grain of calomel may be given every two hours. Where it is desirable to combine iodide of potassium with mercury the following will be found useful :

Potassium iodide	ʒ 2.
Bichloride of mercury	gr. ½.
Syrup of orange-peel	ʒ 1.
Water to make ʒ2.	

A teaspoonful three times daily.

Potassium iodide may be given in milk with little disturbance to the patient. It is also useful in the following formula :

Iodine	grs. 4.
Iodide of potassium	ʒ 4.
Compound syrup of sarsaparilla	ʒ 4.

A teaspoonful three times daily after meals.

In dealing with syphilis in pregnancy mercury is usually more valuable than are the iodides. To combat the anæmia which is present iron or arsenic should be given freely. The following in pill-form may be found useful :

Blue mass	grs. 30.
Powdered chloride of iron	grs 15.

In 12 pills : 1 three times daily.

In using inunctions of mercury a warm bath should be first taken and an area upon the body selected least likely to be irritated by the pressure of neighboring portions of the body or the friction of the clothing. The oleate of mercury or mercurial ointment may be selected. One drachm of mercurial ointment may be rubbed in daily, the surface of the skin being protected by soft flannel at the site of the inunction. In using the bichloride hypodermatically the aggregate dose given is from one sixth to one-third of a grain, administered daily under antiseptic precautions.

Good results have also been obtained by combining bichloride of mercury with extract of opium and extract of gentian, in pills.

The local treatment of syphilitic lesions calls for the thorough use of antiseptics. The parts must be kept clean with douches and dusted with calomel and iodoform, while the discharges should be received upon an absorbent material, which must be burned. The general treatment of syphilitic patients is also important. The anæmia from which they suffer requires the use of iron, arsenic, and often cod-liver oil. Distinct improvement is obtained by stimulants and tonics, while abundant food should be taken.

In cases promptly treated very satisfactory results are obtained, and

a patient who has repeatedly aborted may go to term and obtain a living child.

Cancer usually affects the pregnant patient by attacking the womb or pelvic tissues. Sarcoma may be stimulated to develop with great rapidity throughout the body. Cancer of the uterus grows often luxuriantly, while metastasis frequently occurs. The interruption of pregnancy is of little value in these cases unless the cancerous womb be completely extirpated.

The choice of a method of operation in cancer of the pregnant uterus will depend largely upon the size of the uterus. Wherever possible the womb should be removed through the vagina, if this can be thoroughly done. If the tissues at the side of the uterus are infiltrated, it is often best to open the abdomen, thus being able directly to inspect diseased tissues, and, having placed the necessary ligatures under the eye, to complete the removal by opening the vagina and draining in that way. The abdomen may then be closed completely.

In cases where the patient declines a complete and proper operation the physician may be obliged to palliate by removing the cervix only. This should never be advised as a curative procedure, and is done at the solicitation of the patient, to lessen the discharge, to mitigate the pain, and, possibly, to prolong life. This is best accomplished by the use of the cautery, and should be done as thoroughly as possible.

Although gonorrhœa, syphilis, and cancer are not uncommon among pregnant women, other infections are also met with and may seriously complicate the mother's recovery and destroy the life of her child. **Typhoid** infection may be transmitted to the fœtus and cause its death through continued high temperature and intrauterine bleeding. Pregnancy is interrupted in two-thirds of the cases. It has been shown that the germs of typhoid are transmitted to the fœtus through the placenta. The diagnosis of typhoid in pregnancy should occasion no especial difficulty if it be not confounded with septic fever from surgical infection. It must be remembered that diarrhœa is often observed in septic cases, while anomalous skin-symptoms may also be found in septic cases. These patients should be treated by the bath or sponging and packing, with regular feeding, as is done in these cases in the non-pregnant. If pregnancy is interrupted, it will usually be from high temperature of the mother. Treatment should be employed without fear of abortion, as abortion will be prevented best by controlling the temperature of the mother. Many of these cases are greatly complicated by excessive irritability of the stomach, which requires the use of sedative drugs as well as careful feeding.

Erysipelas in pregnant patients is a grave complication in proportion as it affects the genital tract or remains limited to some other portion of the body. When limited to the face pregnancy may terminate without septic infection of the uterus. Strict antiseptic precautions must be observed in caring for such cases if general infection is to be avoided. Erysipelas about the genital tract or of the lower extremities almost invariably causes puerperal sepsis. Labor is premature in these cases. So far as the fœtus is concerned, it may be infected before birth. An œdematous, red swelling has been observed upon that portion of the

fœtal body corresponding to the location of the disease in the mother. The treatment of erysipelas during pregnancy consists in rest, tonics, stimulants, and carefully protecting erysipelatous surfaces with antiseptic dressings. If this is thoroughly done, it will do much to lessen the danger of septic infection at the time of labor.

Measles is an infectious disorder whose virulence closely resembles that of erysipelas. It may be transmitted to the fœtus, which will suffer from bronchial or intestinal catarrh. If the mother be annoyed by bronchitis, with frequent hacking cough, the violent movements of the abdominal wall may excite uterine contractions and terminate pregnancy. In severe cases broncho-pneumonia may result. The symptoms of measles in the pregnant are those in the non-pregnant, and the treatment of the affection is the same.

Scarlatina forms a grave complication of pregnancy. It attacks the fœtus before birth and threatens the mother with fatal septic infection. The period of incubation in these cases is usually from three to five days.

In cases of mixed infection with scarlatina during pregnancy anomalous eruptions may develop which may greatly obscure diagnosis. If septic infection by other than scarlatinal germs be added, the eruption may become petechial in character and simulate a purpuric condition. If the symptoms connected with the nervous system are pronounced, the condition may resemble very closely cerebro-spinal meningitis. A correct diagnosis can only be made by a careful study of the case, and especially by the throat-symptoms, the period of incubation, and the occurrence of desquamation.

In severe cases, if pregnancy is interrupted by scarlatina, the prognosis for the mother becomes better as pregnancy ceases. It is not well, however, to induce labor, as septic infection and hemorrhage often occur. The infection of **variola** may violently attack the mother and fœtus, rapidly and fatally ending gestation. It is, however, successfully modified by vaccination. Pregnant women are more likely than those not pregnant to be affected by variola. In women, however, who have been vaccinated, the disease runs a mild course, recovery being the rule. Vaccination should be performed during pregnancy whenever necessary. If pure virus be used and with antiseptic precautions, no ill effect will follow. The fœtus is also protected by maternal vaccination. The same is also probably true of vaccination or inoculation for other infective disease, notably for scarlatina and cholera.

Pneumonia always jeopardizes the safety of mother and child during pregnancy. The condition of the pregnant woman is most unfavorable to resist pneumonia by reason of the interference with breathing which the size of the pregnant womb occasions. The heart in pregnancy is often already severely taxed, and hence poorly fitted to withstand the additional labor of pneumonia. It is not surprising that half of all pregnant patients who suffer from pneumonia abort, while the mortality-rate varies from 50 per cent. to 100 per cent. for mother and 80 per cent. for child. The disease is sometimes given by the mother to the child, and children have been born during an attack of

pneumonia from which the mother has died and the child recovered. The symptoms of pneumonia do not differ from those in the non-pregnant. The general temperature is apt to be high and the heart early shows signs of weakness. Breathing is very labored and a tendency to syncope develops early. The treatment of pneumonia occurring during pregnancy requires stimulation from the beginning of the case. It is of no advantage to the patient to induce labor, for in the majority of cases pregnancy is interrupted without interference. When labor occurs moderate hemorrhage will be an advanage to the patient, especially if asphyxia and cyanosis are pronounced. Counter-irritation by cups, mustard, or turpentine is useful, and strychnine and atropine should be used promptly by hypodermatic injections.

Cholera may attack pregnant patients, who seem more than usually susceptible to it. Two stages of the disease are described—one in which copious discharges occur from the stomach and bowels, and the other the stage of intoxication or asphyxia. Many women are taken ill with cholera at night and pass rapidly through the first stage to a typhoid condition. The fœtus usually dies during the second stage. Fœtal movements are usually violent during the first stage. The placenta is affected and hemorrhage and premature separation and abortion often occur. Although labor comes on at the beginning of the second stage, delivery with instruments is often necessary. Post-partum bleeding is rare, and in cases which resist the infection of cholera the processes of involution go on normally. The prognosis for the mother is not more serious than for non-pregnant women. For the child the prognosis is most grave. The treatment of this condition must be conducted without reference to the pregnancy. Should labor occur, it should be speedily ended and care taken to secure good contractions of the womb.

Tetanus sometimes attacks pregnant patients with great virulence. Such women are peculiarly susceptible to the poison of the tetanus bacillus. The first half of gestation is the more dangerous for this infection. The operations rendered necessary by abortion, such as dilating and curetting the womb, are especially likely to cause it. Tetanus is rare after the most important operations which are done at labor. Examination shows that the patients most apt to be attacked are multiparæ above the average age, and living in dirty and poor lodgings. In some cases tetanus has been observed in patients who have had endometritis.

Tetany is not infrequent during pregnancy. It is characterized by spasms in the muscles of the extremities, especially those of the hand. In severe cases the entire muscular system is affected, the spasms occurring on both sides and not produced by external irritation. There is no loss of consciousness, attacks being intermittent. While, as a rule, no paralysis follows the spasm, a feeling of numbness and prickling in the parts affected, preceding the spasm and after the convulsions cease, is often described. This sensation may be induced by compressing the bloodvessels of the affected limb. Heat or cold by local use may stop the convulsive motions. The disease most frequently attacks the flexors of the extremities. The nerves of the affected parts show greatly

altered condition on testing by different currents. There is no fever, but any mechanical irritation brings on spasms. The disorder is not often widespread. It may occur during pregnancy or during the puerperal period.

The contrast between tetanus and tetany is very marked. The former is nearly always fatal, with pronounced symptoms. The latter rarely kills the patient, and is susceptible of treatment. While little can be done in the actual treatment of tetanus, it should be remembered that antiseptic precautions will prevent it, and that its occurrence is owing largely to a neglect of surgical care. The treatment of tetany consists in giving drugs to procure sleep, in putting the patient at rest, and keeping up her strength by appropriate tonics.

Direct violence and its effect on pregnant patients, by accident or through some necessary surgical interference, may seriously complicate gestation. The pregnant patient may be subjected to direct traumatism from various causes. The effect of such interference with pregnancy is sometimes disastrous in the premature ending of gestation, with hemorrhage, shock, and possible septic infection. In other cases patients endure an injury and recover, without the interruption of pregnancy, in a most surprising manner. The reason for such difference is to be found in the general condition of some patients, who are in good health before injury, or in the depressed and nervous condition of other women who suffer severely. It is of especial importance that the lining membrane of the uterus be healthy and sound if pregnancy is to continue. Great difference is observed in the results of injury to various portions of the body. Thus, naturally, direct violence to the uterus has most often ended gestation. A stab-wound or pistolshot wounding the uterus is followed by the interruption of pregnancy. The same is generally true when injury occurs to the perineum, to the rectum, or to some portion of the body which is intimately connected with the sensory nerves of the genital organs. Irritation of these nerves almost invariably ends by interrupting pregnancy. So far as surgical operations are concerned, the development of disease in uterus and appendages may necessitate operation upon these parts. Cancer of the uterus calls for total extirpation of the womb at the earliest possible moment. Whether this is to be done through the vagina or through the abdominal wall will depend upon the size of the diseased organ. Fibroid tumors of the uterus often demand surgical interference during pregnancy. Either myomotomy or myomectomy will be chosen in these cases in accordance with the size and location of the tumor to be removed. In either case the result of the operation when properly performed is usually successful without the interruption of pregnancy. Amputation of the pregnant womb may also be necessary in cases of contracted pelvis. The best method of operating in these cases is by abdominal incision, ligation of the ovarian and uterine arteries, followed by amputation of the uterus, leaving a stump of cervix to close the vagina, and stitching over its stump flaps of the peritoneum.

In cases of pregnancy complicated by ovarian tumor but one treatment is advisable, and that is the removal of the tumor. The best

time for such operation is about the fourth month of pregnancy. No period of pregnancy, however, positively forbids ovariotomy, and in all cases removal of the tumor is indicated. Diseases of the Fallopian tube sometimes require surgical treatment in the pregnant patient. The prognosis in these cases is as good as in those not complicated by pregnancy, while the same indications for operation exist which justify interference in other cases. When it is found that a hæmatosalpinx has ruptured, it is often impossible to distinguish this condition from ruptured tubal gestation.

The tolerance of accidents and injuries which pregnant patients often show is surprising. Those who have practised among negroes have observed remarkable recoveries during pregnancy in negro women after suffering injury.

In penetrating wounds of the abdomen, if the uterus is not injured, pregnancy need not be interrupted. The wall of the abdomen may be torn open and the intestines protrude and still recovery ensue. Intestinal obstruction may exist and be treated by abdominal section, with the recovery of the patient and the continuance of pregnancy. Stone in the bladder may be successfully removed without premature labor following. Pregnant women have sustained severe gunshot-wounds through the chest without premature labor. A bullet may penetrate the abdomen, the uterus escaping, and pregnancy remain uninterrupted. Occasionally the condition of pregnancy will bring to light a foreign body introduced some time previously. Thus, a case is reported in which a spoon swallowed two and a half years previously was forced through the wall of the intestine by the pressure of the enlarged womb, causing fatal peritonitis.

In fatal accidents to pregnant women it is of interest to note that severe fractures may occur in the pelvis or limbs with rupture of the abdominal wall and rupture of the uterus without breaking the fœtal membranes. It is also important to observe that erysipelas, when complicating an injury, so long as it does not attack the vicinity of the genital organs, need not interrupt pregnancy. Pregnant women may receive severe burns and escape labor. Where, however, the burn is fatal or where the abdomen is burned, when the fœtus is born it may be found dead with a blister on the portion of the body corresponding to the mother's injury. Minor operations, such as blistering and the use of the cautery, are most apt to interrupt pregnancy. Although cancerous breasts may be removed during pregnancy, and stone in the bladder be removed, or amputation be performed at the hip-joint, an operation for hemorrhoids, on the contrary, is very likely to terminate gestation. Fractured bones knit together poorly during pregnancy.

In general, in deciding upon operations on pregnant patients, the excretory organs should be placed in the best possible condition. Hemorrhage is to be carefully avoided, as also is unnecessary shock. Septic infection in its results may be more severe than in the non-pregnant. Operations upon the abdominal organs are especially well borne. So far as the choice of anæsthetics is concerned, chloroform will be found in most cases preferable. The resisting powers of the uterus do not seem strange when one remembers that the uterus has been curetted,

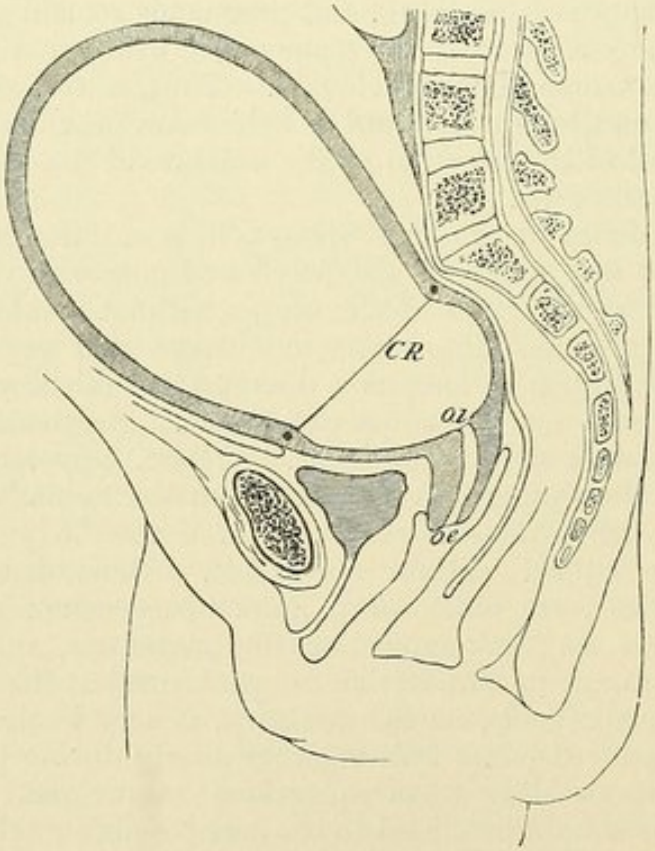
douched with hot water, and painted with iodine, under the belief that chronic inflammation was present, without interrupting a pregnancy which was not discovered until several months later. The prognosis of pregnancy and labor complicated by abdominal tumors is so grave that no hesitation should be felt in undertaking their removal.

CHAPTER VIII.

NORMAL LABOR AND ITS MANAGEMENT.

In order to understand normal labor it is necessary first to consider the anatomy of the birth-canal and the forces which result in the expulsion of the fœtus. The bony pelvis of the mother is so placed in the skeleton that its axis describes a curve extending from a point midway between

Fig. 54.



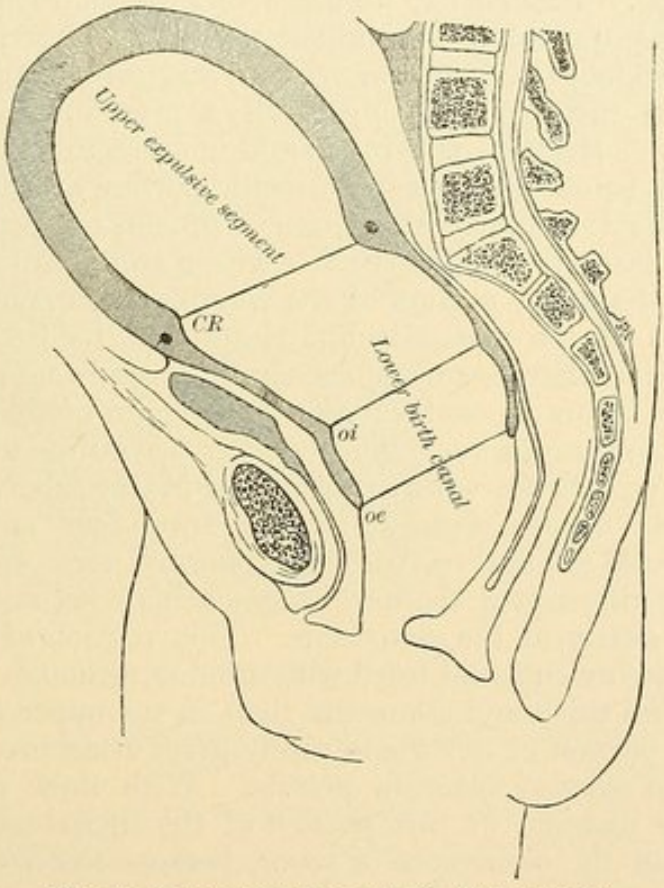
CR. Contraction-ring. *oi.* Internal os. *oe.* External os. (Schroeder.)

the promontory of the sacrum and the pubes to a point midway between the tip of the coccyx and the under surface of the pubes. This line may be demonstrated to be a mathematical curve, which, for purposes of anatomical study, is of interest and value. The inclination of

the pelvis may be estimated by studying the planes of its inlet and outlet and their relation to the perpendicular line of the body. The physician, however, is more interested in the birth-canal of the living patient, its size and shape, and the muscular tissues whose activity results in the process of labor.

At the termination of pregnancy the well-developed uterus measures from fourteen to twenty inches in length and weighs from one and one-half to two pounds. It is composed of three distinct portions, each of which has a separate function in parturition. The relative size of these portions may be represented by dividing the length of the uterus into six parts, when the upper or contractile segment will contain relatively four of the six, the lower uterine or distensile segment will contain one of the six parts, and the cervix the remaining portion. The functions of these three portions of the uterus are to expel the fœtus until it reaches the floor of the pelvis, to maintain its position of flexion, and to form a continuous birth-canal from the uterus to the vagina.

FIG. 55.



The uterus distended during birth. (SCHROEDER.)
Lower birth-canal is composed of the lower uterine segment (from *CR* to *oi*), and the cervix (from *oi* to *oe*).

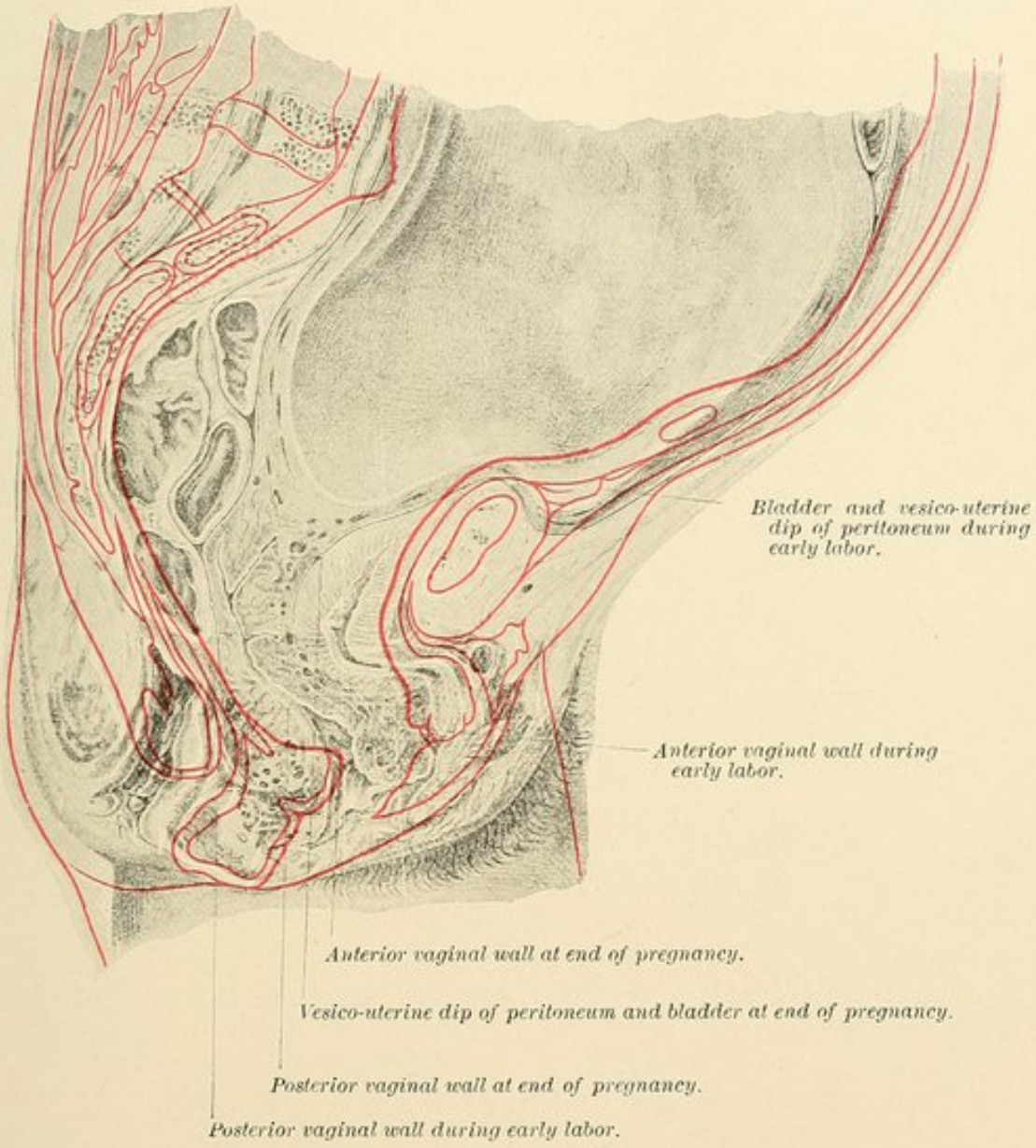
The upper expulsive portion of the uterus comprises two-thirds of its extent, and is composed of interlacing muscular fibres which are arranged in three directions, namely, in a circular manner, in a longitudinal, and in an interlacing arrangement. If a recently emptied uterus be

cut through, the thickness of the uterine wall at its thickest portion will be found to be from three-quarters to one inch. Between the muscular fibres the mouths of bloodvessels can be seen as large as the ulnar artery. The uterine muscle is firm in texture and closely covered with its peritoneal coat and lined with the deciduous membrane. At the upper and outer portions of this part of the womb the muscle is seen to be arranged in circles around the orifices of the Fallopian tubes. If an attempt is made to dissect the individual fibres of the uterine muscle, the undertaking is one of great difficulty, because of the interlacement of the fibres. The shape of the uterus at term is ovoidal, the broader end of the ovoid being above and the smaller end below. The upper portion of the womb at labor extends to a broad hand's-breadth above the umbilicus, crowding the intestine up against the diaphragm. The uterus lies obliquely in the pelvis, its right cornu being higher than the left. Examination of the muscle of the uterus shows it to be of the unstriped variety, its fibres developing from nuclei by the formation of long and interlacing filaments. An estimation of the actual work done by the uterine muscle during labor is necessarily a difficult thing. Practically, we know that its contractions are sufficiently powerful to paralyze temporarily the hand and arm of the physician when introduced to perform version, and sufficiently powerful to force the fœtus through the bony pelvis, a procedure which requires very considerable strength when the child is extracted by forceps.

Immediately below the upper contractile portion of the uterus there is developed the lower distensile uterine segment, composed of a large proportion of elastic tissue, interwoven with a continuation of the muscular fibre of the upper portion of the womb. The contractile power of this portion of the uterus is but slight, but its function in labor seems to be to maintain a continuous elastic pressure upon the presenting part which favors its conformation to the inlet of the pelvis. The extent of the lower uterine segment varies according to the stage of labor and in accordance with the character of the labor. In normal cases the lower uterine segment extends from four or five fingers'-breadth above the internal os, while in abnormal cases where the birth is delayed and interrupted, the lower segment may become so distended as to stretch nearly to the umbilicus. This portion of the womb is covered with peritoneum and lined with decidua, although the deciduous membrane is less thick and abundant than in the upper portion of the uterus. This portion of the womb rarely gives attachment to the placenta, except in cases of placenta prævia. With these cases it is the location of the placenta in this portion of the uterus which gives rise to danger upon the occurrence of labor, because the distention of the lower uterine segment inevitably separates the placenta, either wholly or partially, from its attachment. (Plate VI.)

The lower uterine segment is of practical interest because it is the site of rupture of the uterus in most cases. This is but natural when one considers that it is the thinnest portion of the womb. In most cases of rupture the actual tear is found to occur across the anterior wall of the uterus at the juncture of the upper and lower segments. The rent is usually transverse in extent, ragged in outline, the upper

PLATE VI.



Section showing Bladder in Pregnancy. Red line indicates Parturient Section. (HART.)

portion of the womb seeming to have torn itself loose from the attachment of the lower. In some cases the laceration occurs upon the posterior wall of the uterus. If an attempt be made to suture a tear of the uterus immediately after its occurrence, the edges of the tear are found so ragged that an accurate approximation is very difficult. The lacerated tissues show the diminution of the muscular fibre from the upper toward the lower uterine segment and the interlacing character of the elastic and connective tissues.

The third and lower portion of the womb is the cervix, extending from the external to the internal os. The length of this portion of the uterus does not vary essentially during pregnancy or labor. In the primigravida the external os remains small but partially opened until the dilatation of the upper portion of the cervix is complete. In multigravidæ, however, the external os remains partially opened, its lips are everted and somewhat fissured, while the greater resistance to dilatation is experienced at the internal os. The cervix is composed essentially of fibrous tissue, the development of muscular fibre occurring at the internal os in sufficient degree to form a sphincter of the uterus. This muscular tissue is not present in considerable amount, but forms the termination of the muscular fibres of the upper and lower segments.

As the cervix is the portion of the uterus accessible to examination during labor, its contour and direction are of practical interest to the physician. In primiparæ, as the head descends, the lower uterine segment and the internal os become first dilated, the external os and cervix are directed downward and backward into the hollow of the sacrum. This renders the external os less accessible to the finger of the examiner, and may occasion difficulty in diagnosticating the stage of labor. Remembering this, the physician, in making an examination, will endeavor to carry the finger backward, and if difficulty is experienced through the resistance of the perineum, he will do well to turn the patient upon her side, when the pelvic floor can be readily drawn backward and no difficulty will be experienced in finding the os and cervix. In cases where the external os is very small and the tissues about it are resisting the cervix may become so greatly thinned as to give to the finger the feeling of the head covered by the membranes. The cervix has been punctured in the effort to rupture the membranes in such a case. If the finger be passed about the external os in a primipara during labor, a firm, tense edge can sometimes be felt which dilates very slowly. This is the margin of the fascia and connective tissue of the cervix, and is sometimes so resisting as to require division.

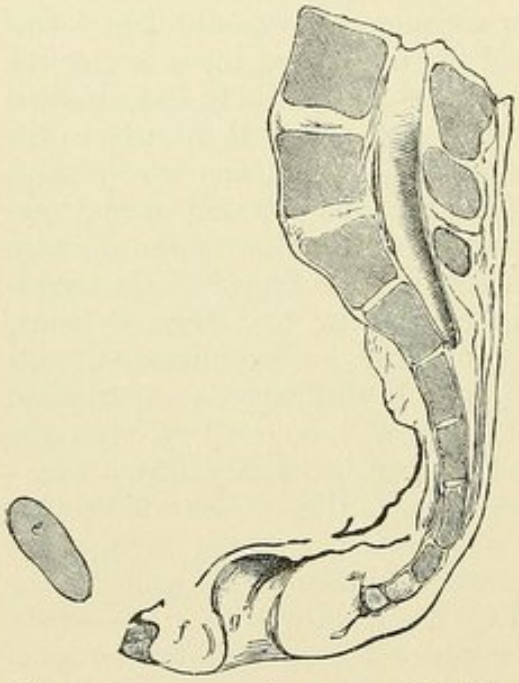
The cervix is lined with its mucous membrane, and not with decidua. The placenta is never attached to the cervix proper, but always to the lower uterine segment, in placenta prævia, just above the cervix. This fact has an important practical bearing in dealing with cases of placenta prævia by the use of the tampon and by dilatation.

The uterus terminates in the cervix upon the pelvic floor and in the vagina. The attachment of the uterus to the vagina is by fibrous and elastic tissue, which is capable of considerable distention during the process of birth. The position of the uterus is such that the line of direction taken by the fœtus in passing out of the uterus is a line

downward and backward. This distends the posterior wall of the vagina, drawing it gradually up over the head as the fœtus is expelled. The anterior wall of the vagina is compressed, during labor, beneath the pubes and subjected to less strain than is the posterior. The curve of the pelvis and the distention of the posterior vaginal wall are such that rupture of the vagina from the uterus occurs most frequently along the posterior wall in the hollow of the pelvis, in Douglas's cul-de-sac.

The pelvic floor is a muscular diaphragm pierced by the openings of the rectum, the vagina, and the urethra, and composed of two segments, which together form the levator ani muscle with its fascia. Dissection has shown that the pelvic floor is composed of three portions of interlacing muscle and fascia, attached to the coccyx and sacrum, to the ischium, and to the pubes. These muscles contract in a direction upward and slightly backward, thus tending to support the uterus, bladder, and rectum, which are above them. At the occurrence of labor the pelvic floor is functionally divided into two segments, of which the posterior is the larger and the more important. This comprises the muscle and fascia attached to the sacrum and coccyx and to the sides of the ischia, and interlacing in the pelvic floor to form the tissue commonly called the perineum. As far as labor is concerned, the posterior segment of the pelvic floor embraces the posterior wall of the vagina, and the tissues between it and the sacrum and coccyx. The function of this segment of the pelvic floor during labor is, by the retrocession of the coccyx, to dilate downward and backward, thus opening the orifice of the vulva and permitting the extrusion of the fœtus. This action is sometimes impeded if the sphincter of the vagina be tight and resisting, and this complication is demonstrated when the sphincter is incised and the posterior segment of the pelvic floor at once drops downward and backward.

FIG. 56.



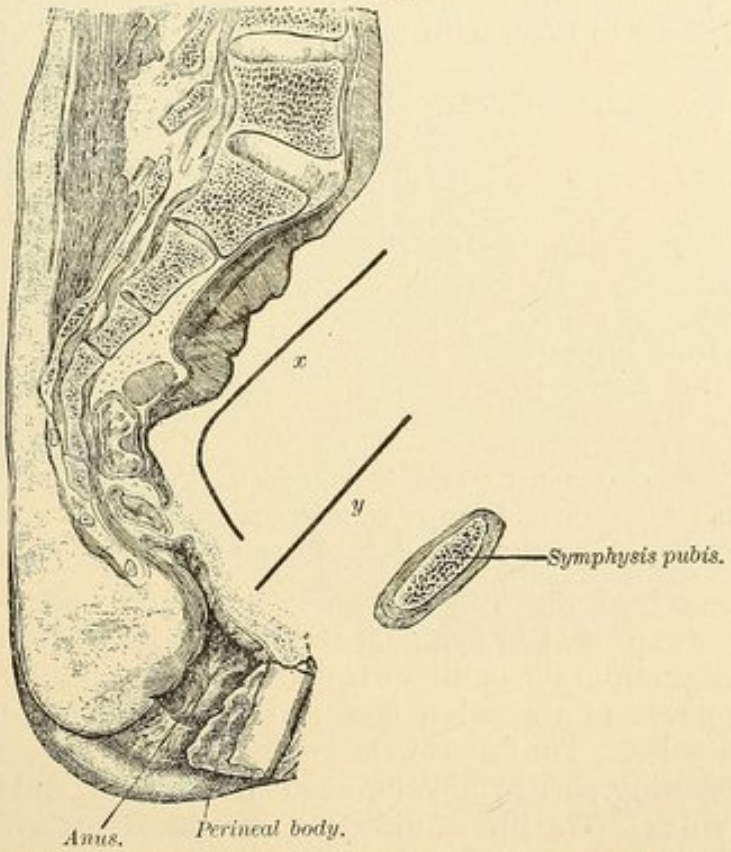
The sacral or supporting segment *f g* of the pelvic floor and posterior vaginal wall in sagittal mesial section. The pubic or displaceable segment, uterus, and posterior vaginal wall have been removed. *e*. Symphysis pubis. *f*. Perineal body. *g*. Anus. (HART.)

The anterior segment of the pelvic floor embraces the anterior wall of the vagina and the fascia and connective tissue which support the urethra and the neck of the bladder. This segment is without active function in labor, except that it is drawn upward and inward, and is usually tightly compressed during the passage of the child beneath the pubes.

The soft tissues of the birth-canal at labor form a continuous muscular and membranous tube of between two and three feet in length.

This tube is composed at its highest point of the dense muscular tissue of the uterus, which gradually becomes thin and blended with the elastic tissue until the pelvic floor is reached, when strong muscle and fascia are present. The axis of the uterus in labor is the line of direction taken by the fœtus in passing out of the womb. When uterine contractions occur the round ligaments of the uterus contract and bring the upper uterine segment forward so that its axis coincides with that of the pelvic brim. This tends to force the child downward and backward through the bony pelvis. When this is accomplished the fœtus meets the resistance of the pelvic floor, and the muscular tissues of its two segments contract, at the same time relaxing its elastic fibres and alternating its muscular contraction with relaxation. The action of the birth-canal is essentially that of peristalsis, namely, muscular contraction followed by the distention of elastic tissue and alternating with periods of muscular repose. As the fœtus advances, the longitudinal, muscular, and elastic fibres of the uterus draw the tissues upward over the fœtus, thereby increasing the distention of the portion of the birth-canal remaining below and aggregating the muscular fibre of the uterus which is above, and which is forcing the fœtus downward.

FIG. 57.



Sagittal mesial section of pelvis to show sacral segment. (HART.)

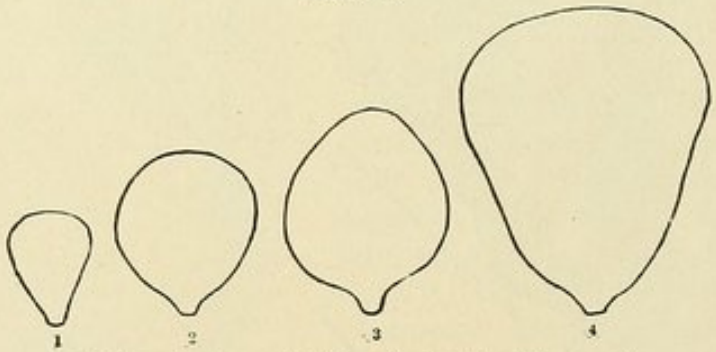
x and *y*. Lengths of paths described by fœtal parts lying posteriorly and anteriorly in pelvis.

When the child reaches the pelvic floor, the lower sacral segment moves strongly upward and backward, while the anterior segment draws upward and inward and is compressed beneath the pubes.

The anatomy of the blood-supply of the uterus during labor is of

practical importance to the physician, in view of the control of hemorrhage arising either through uterine relaxation or by reason of traumatism. The blood-supply of the uterus from the ovarian and uterine arteries enters at such a point that, when the uterus is emptied at labor, these arteries are brought within the bony cavity of the pelvis and are subjected to the pressure of the pelvic walls. The result of this is seen in the gradual cessation of bleeding through diminution in the arterial supply of the womb. The contraction of the muscular fibres of the uterus closes the wide-mouthed sinuses which are seen in its wall. Not only is this so, but the arteries so enter the womb that the position of marked anteflexion of the recently emptied uterus serves to assist greatly in compressing the uterine arteries at the sides of the cervix. It is evident that the bloodvessels of the uterus are not readily exposed to traumatism during labor. It very rarely happens that rupture of the womb tears either the uterine or ovarian arteries. The cervical artery is often wounded in cases of severe laceration of the cervix, where the rent extends into the vaginal junction, opening the circular cervical artery. For purposes of operation the anterior wall of the uterus offers a surface free from large vessels and capable of ready closure by means of suture. Where it is necessary to remove the uterus or to amputate it the situation of its vessels is such that the operator can usually gain access to them with but little difficulty. (Plate VII.)

FIG. 58.

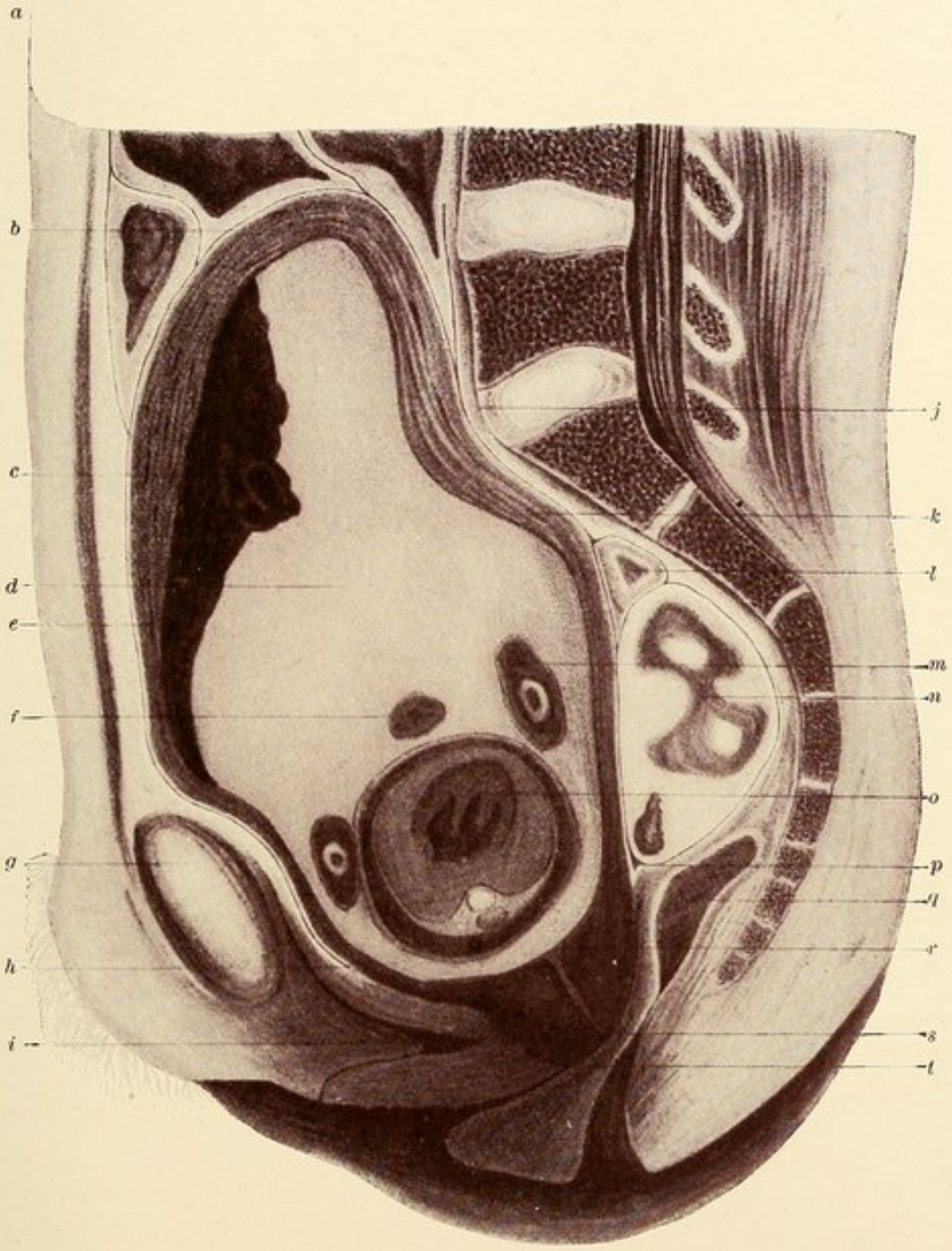


Outline of uterus seen from the front. (WEBSTER.)

1. At the beginning of pregnancy. 2. During the third and fourth months. 3. At the beginning of the fifth month. 4. At the end of pregnancy.

While the axis of the uterus is downward and backward, and its force is largely expended in bringing the fœtus through the bony pelvis, the child emerges from the mother's body through the combined forces of the resisting power of the pelvic floor and the contractile force of the abdominal muscles. The force of the pelvic floor is sufficiently strong to cause the presenting part to move upward and forward, and thus emerge through the vulva. The line of direction then taken by the fœtus during its birth is at first downward and backward and then upward and forward. This is the working axis of the birth-canal; this is the line of force which the operator must imitate in all artificial delivery. Failure to understand the anatomy of the birth-canal of the living patient will result in improper efforts to aid labor. The application of this knowledge is seen practically when we assist the passage of the fœtus through the pelvis by manipulation, by pressing downward and backward

PLATE VII.



Pelvis and Contents, Fifth Month of Pregnancy. (WEBSTER.)

a. Level of umbilicus.
b. Fundus uteri.
c. Placenta.
d. Liquor amnii.
e. Venous sinus.
f. Umbilical cord.
g. Symphysis pubis.
h. Utero-vesical pouch.
i. Bladder.
j. Promontory.
k. Junction of upper and lower uterine segments of posterior wall.
l. Bit of rectum.
m. Arm of fœtus.
n. Dermoid tumor of right ovary.
o. Fœtal heart.
p. Pouch of Douglas.
q. Rectum.
r. Os internum.
s. Os externum.
t. Anterior fornix.

upon the fundus of the uterus, and by placing the hands upon the presenting part and carrying it downward and backward through the pelvic brim. In expressing the placenta we bring the fundus of the uterus forward and exert pressure downward and backward. In promoting uterine contraction during labor, or to check hemorrhage, we bring the uterus into the line of the birth-canal and exert our pressure downward and backward. Our knowledge of the anatomy of the bloodvessels enables us to compress them against the sides of the pelvis, and thus to lessen arterial flow. In performing version we make traction downward and backward until the pelvic floor is reached by the head. In the high application of forceps we proceed in a similar manner.

In promoting the distention of the pelvic floor during delivery we take care to keep the head well up beneath the pubes and to further the contraction and relaxation of the posterior segment of the pelvic floor, which carry its tissues upward and backward over the head. Remembering this action of the posterior segment, we avoid interfering with it in efforts to prevent laceration. In delivering the child with forceps when the head is upon the pelvic floor we endeavor to imitate the mechanism of labor by keeping the head well up beneath the pubes, and by alternately extending and relaxing the pelvic floor. While the minute anatomy of the birth-canal is a matter which cannot readily be carried in mind by the practising physician, a practical knowledge of its structure and function is absolutely essential for the safe practice of obstetric art.

By **labor** we mean the expulsion from the mother's body of her fœtus and its appendages, and by normal labor we mean the birth of the living child without injury to mother and child, and without assistance.

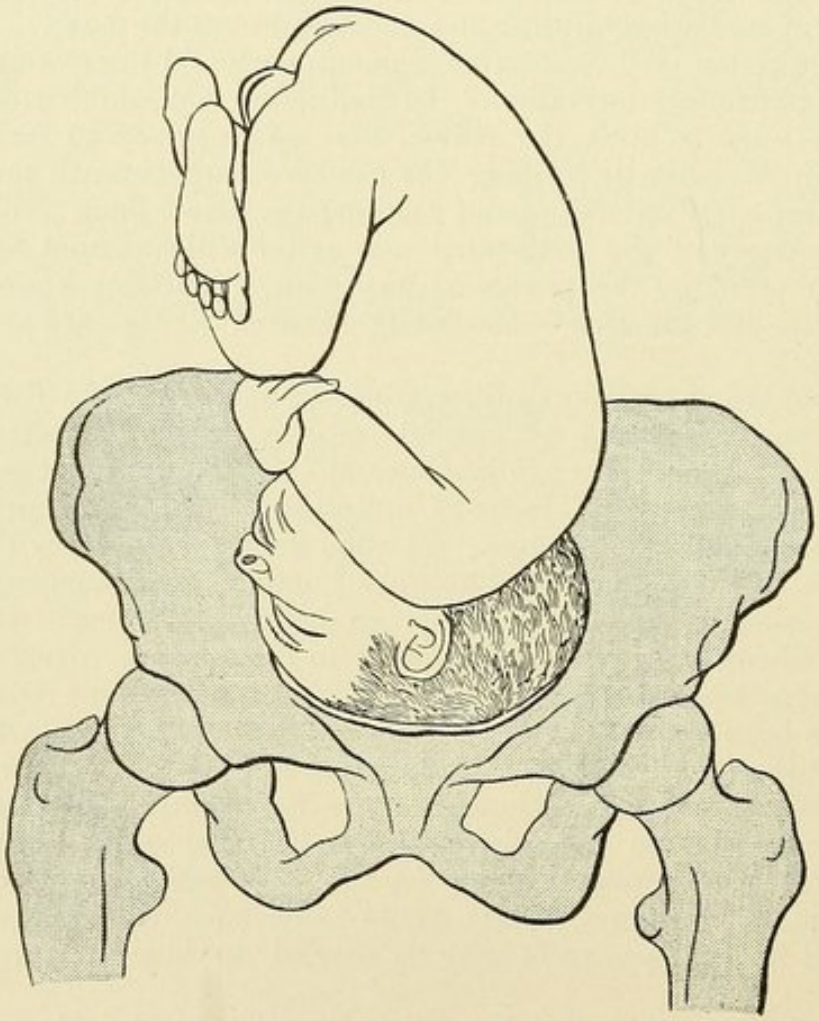
The exciting cause of labor is unknown. Although an average length is observed in pregnancy, yet cases differ not only by days, but sometimes by weeks in the duration of gestation, although in these cases no cause in mother or child can be found for such difference. The best illustration which can be used to describe the causes of labor is that of a ripened fruit which falls from the parent tree. This simile has been employed for centuries among the Germans, who speak of the fœtus as the fruit and call the fœtus at term the ripe fruit. The fruit, when grown, may be said to be thoroughly ripe when it no longer depends upon or needs for future life that which produced it. This is true of the human fœtus, for the most rational explanation of the ending of pregnancy asserts as its cause such development of the fœtus that its vital processes may be carried on independently of the mother.

It is also true that the fœtus furnishes a considerable amount of waste material which is discharged into the mother's blood. The accumulation of this material serves as an irritant to the mother's nervous system, stimulating uterine contraction. Certain circumstances are favorable for the occurrence of labor. Such are any actions on the part of the mother which set up uterine contraction. Any cause which excites the nervous system may bring about the occurrence of labor. At a time of great public calamity abortion and premature labor often

occur. Direct violence may also cause labor to begin. Those conditions which are favorable to the postponement of labor are a perfectly regular life without interruption, freedom from anxiety and hard work, abundant food, and an absence of active exertion. In such conditions labor may be delayed two, three, or four weeks beyond the usual termination of pregnancy.

The symptoms and signs of approaching labor are the gradual sinking of the child into the pelvis of the mother, which produces irritation of the bladder and rectum and irregular uterine contractions, often causing considerable pain. The growing smaller of the abdomen, which is noticeable by reason of the greater looseness of the patient's clothing, a slight swelling of the legs and feet, restlessness, and derangement of sleep, and often a vaginal discharge of whitish mucus are also present.

FIG. 59.



First position, vertex presentation. (FARABOEUF and VARNIER.)

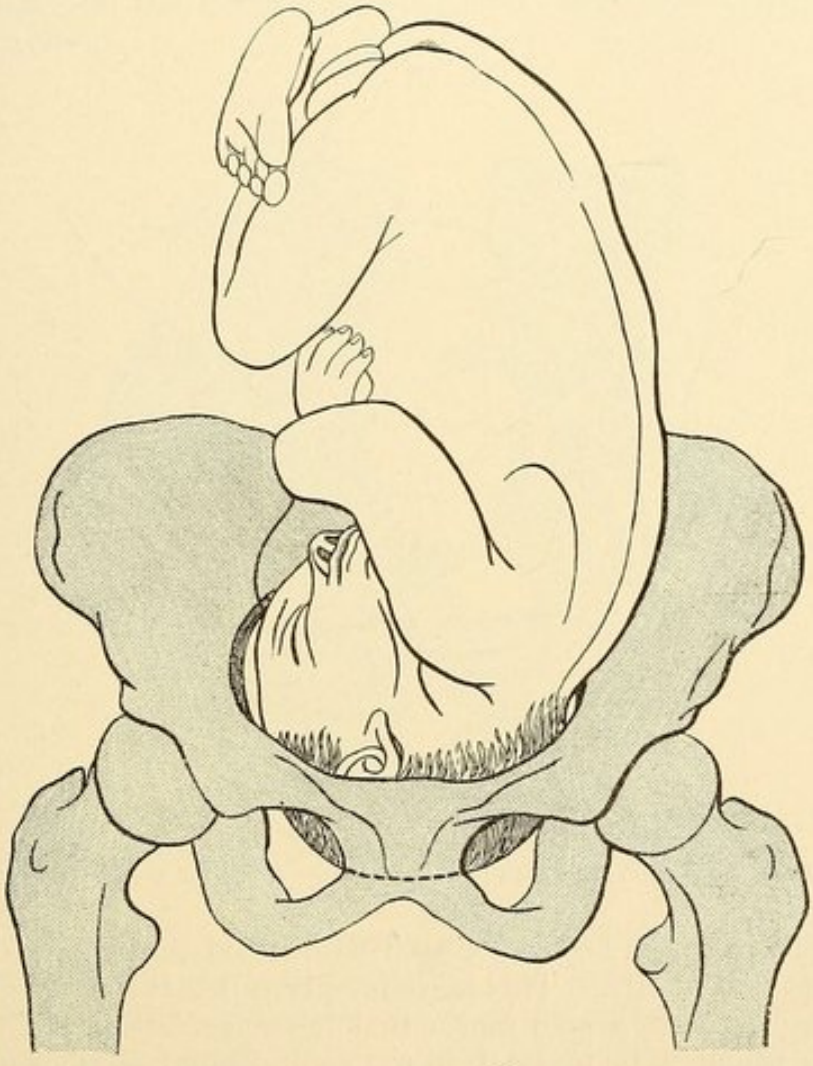
If an examination of the abdomen be made by palpation, the child will be found with the presenting part within the brim of the pelvis. The movements of the fœtus may be felt to be active, and intermittent uterine contractions can be detected during palpation. By internal examination in primigravidæ the external os will be found but little open, the presenting part within the pelvic brim; the cervix soft and

its canal anointed with increased secretion. It may be possible through the distended lower uterine segment to feel sutures and fontanelles. In multigravidæ it may be possible to pass the finger within the uterus and to outline the presenting part and diagnosticate the position.

The process of labor is naturally divided into three portions or stages —the opening and dilating of the uterus and the genital canal; second, the expulsion of the fœtus; and, third, the expulsion of its placenta and membranes and the contracting of the empty uterus.

In treating of the position and presentation of the fœtus we shall make but two positions for each presentation. At the beginning of normal labor the head has entered the brim of the pelvis, its vertex to the left of the median line and in front of a line drawn transversely

FIG. 60.



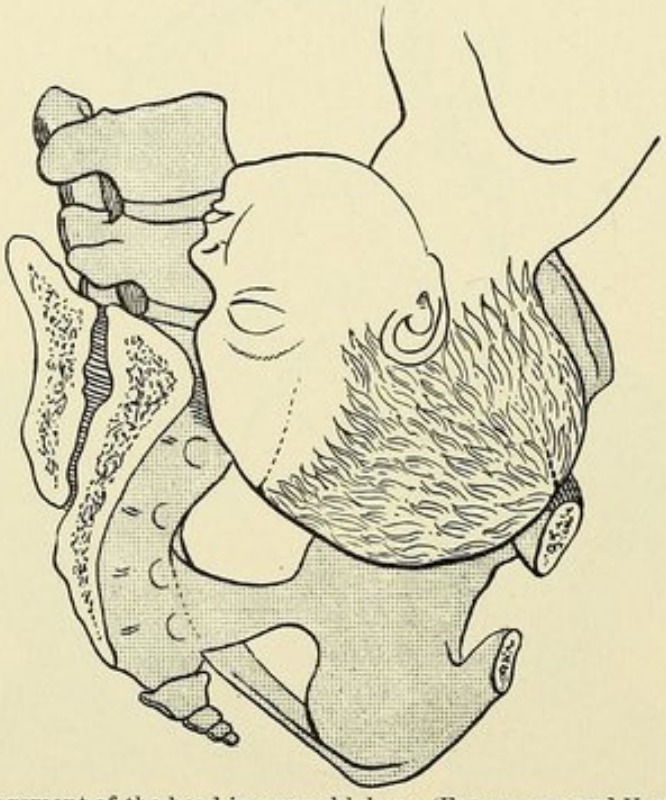
The fœtus during the second stage of normal labor. (FARABOEUF and VARNIER.)

through the pelvis between the spines of the ischia. The back of the child is directed toward the mother's left side, the bisacromial diameter of its trunk being about to engage in the left oblique diameter of the pelvic brim. Such are the position and presentation of the fœtus when active labor begins in normal cases. The gradual fitting of the fœtus

into the pelvis goes on for days and weeks before its active expulsion begins. It might be reasonable to include this process under the term of labor, but use restricts the term to the actual expulsion of the child.

The subjective signs of labor result from uterine contractions. The pain is often ill-defined in the lower portion of the abdomen, and may be at first ascribed to indigestion. As the greater part of births occur during the night, the patient very commonly blames some indigestible article of food eaten during the past day. The pains, however, become periodic and gradually spread to the back, to the region known commonly as the " small of the back." These pains become stronger at regular intervals, apparently arising from the back and extending around to the pubic region. Examination at this period may fail to discover dilatation of the os or may find the os partially dilated and the cervix partially effaced.

FIG. 61.

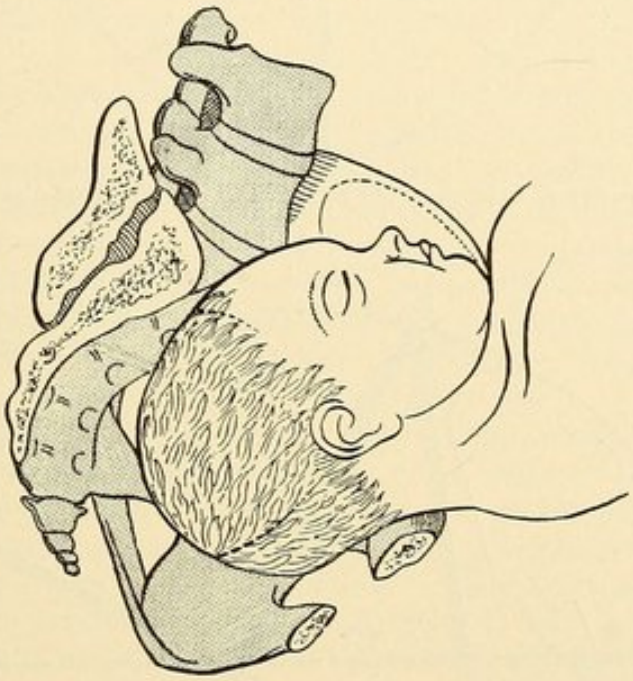


The engagement of the head in normal labor. (FARABOEUF and VARNIER.)

A discharge which becomes tinged with blood occurs as soon as the cervix begins to dilate. This is commonly called " the show," and is usually regarded as a sign that actual labor has begun. The amount of mucus which is poured out in the genital canal as labor proceeds is sometimes indicative of the normal progress of labor. In cases where this secretion is absent the course of labor may be retarded very considerably. The progress of labor at this stage may be noted by observing that the pains become more severe, the intervals between them shorter, while the patient soon gives evidence of a desire to adopt a posture that shall best favor the descent of the child through the pelvis. It will be found at this stage of labor that patients naturally

bend forward, often leaning the upper portion of the body against the back of a chair or some object which gives support to the arms. The patient will instinctively flex the thighs upon the body, thus relaxing the muscles at the brim of the pelvis. The symptoms of the first stage of labor already described become more and more pronounced until the second stage has begun by the bursting of the membranes. In primigravidæ examination will disclose the gradual disappearance of the cervix, the continued descent of the presenting part, and the gradual protrusion of the membranes and amniotic liquid in the progressive dilatation of the external os. In normal cases the membranes remain unbroken until dilatation is complete and the head has descended through the greater portion of the pelvic cavity. In multigravidæ, the period of dilatation is commonly shorter. The external os is first dilated and then the internal; while the membranes, if the internal os is readily opened, may descend to the pelvic floor and often protrude from the vagina.

FIG. 62.

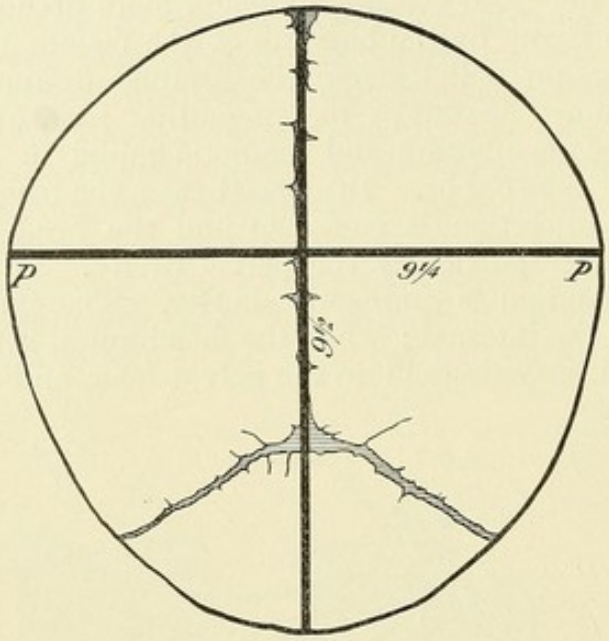


The descent of the head in normal labor. (FARABOEUF and VARNIER.)

The second stage of normal labor is characterized by active uterine contractions, which are supplemented by contraction of the abdominal muscles, often aided by voluntary efforts of the patient. The intervals between the pains become shorter until from three to five minutes elapse between each pain. The complaint of suffering is often less than in the first stage of labor, because the patient feels impelled to make strong, voluntary efforts, and hence is less occupied with her suffering. Patients rarely remain in any but a recumbent posture, lying in bed upon one side or the other and occasionally kneeling upon the floor by the side of the bed or partially sitting and reclining in a large chair at the bedside. The shape of the abdomen changes

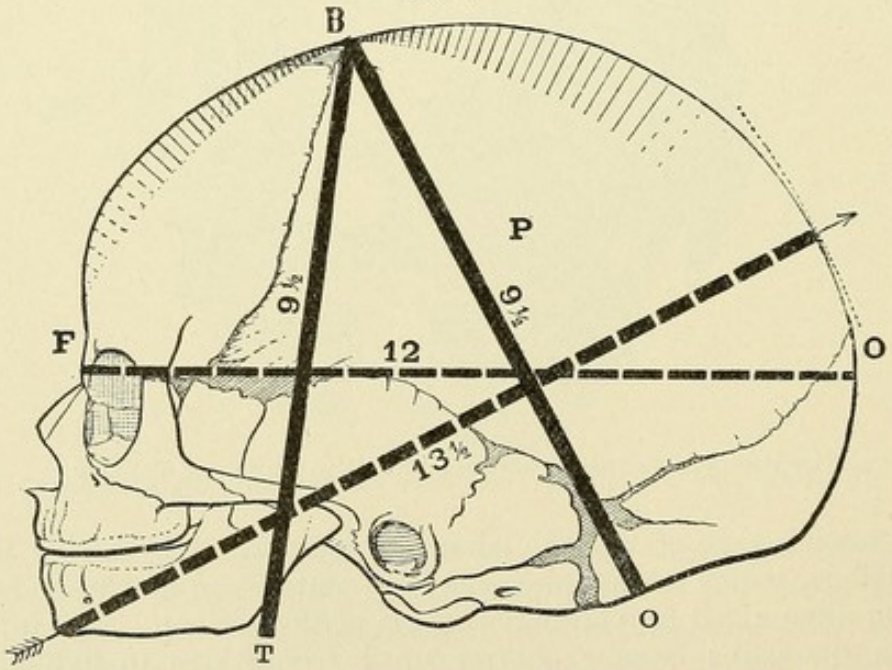
during the second stage of labor, as the round ligaments draw the upper portion of the uterus upward and forward, thus causing a pro-

FIG. 63.



The length and breadth of the fœtal head. *pp.* Biparietal diameter.

FIG. 64.



The dimensions of the fœtal head. (FARABOEUF and VARNIER.)

OF. Occipito-frontal diameter. OB. Suboccipito bregmatic. BT. Trachelo-bregmatic. The maximum diameter is indicated by the long dotted arrow. Measurements are in centimetres.

trusion in the abdomen. Occasionally great irritation of the bladder and rectum is induced at the second stage of labor.

Examination of the abdomen during the second stage of labor will find by palpation that the head of the fœtus is descending through the pelvis and gradually passes beyond the reach of the hands of the physician. In palpation the back of the fœtus is at first oblique in the abdomen, the right shoulder being directly toward the right side of the mother and the trunk of the fœtus gradually entering the pelvis as labor proceeds. When the head reaches the pelvic floor and rotates the shoulders continue to descend, rotating partially, so that the back of the child, by palpation, seems often to have rotated within the pelvic cavity. Upon vaginal examination during the second stage of labor the vertex will be found directed toward the left side of the mother's pelvis, just in front of the median line. The smaller fontanelle cannot be felt as a space between the bones, because the bones of the skull are pressed together by uterine contractions, thus obliterating the smaller fontanelle. There can be felt, however, the meeting-place of three bony ridges or lines. One of these is the sagittal suture and the others are the sutures between the occipital and parietal bones. It is generally possible to locate this point upon the vertex during the second stage of labor. It is often comparatively easy to find the anterior fontanelle. By beginning at the posterior fontanelle with the examining-finger and passing it along the sagittal suture the finger reaches gradually the anterior fontanelle. The two fontanelles and the sutures enable the physician to diagnosticate the position of the fœtal head with reference to the pelvic cavity. It is sometimes impossible to reach the anterior fontanelle by reason of a rigid perineum or because of extreme flexion of the head, which naturally carries the larger fontanelle higher than usual. It is quite sufficient for purposes of diagnosis to recognize the smaller fontanelle and the sagittal suture.

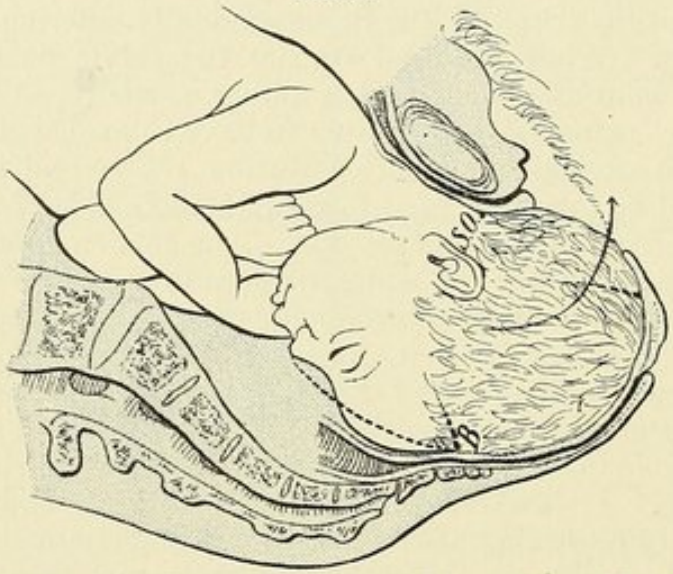
A better understanding of labor is obtained by comparing the internal measurements of the bony birth-canal with those of the head of the fœtus. The internal antero-posterior diameter of the pelvic brim measures 11 cm. (4 to 4¼ inches). The transverse diameter is, in the living patient, 11¾ to 12 cm. (4½ to 4¾ inches). The obliques are the largest diameters of the pelvic brim, 13 cm. (5 inches). It is evident that a normal head can enter the brim of a normal pelvis by bringing any diameter but its maximum (13½ cm.) to present to one of the oblique diameters of the pelvic brim. This accounts very largely for the oblique position of the head in the beginning of normal labor. The average diameter of the cavity of the bony pelvis is 12½ cm. (4¾ inches). The head, when flexed, can rotate freely in a normal pelvis, as it presents in flexion with its suboccipito-bregmatic diameter (9 cm., 3¾ inches).

The antero-posterior (pubo-coccygeal) diameter of the pelvic outlet is 9 cm. (3¾ inches), which is enlarged by the backward movement of the coccyx to 13 cm. (5 inches). The transverse diameter of the pelvic outlet (between the tuberosities of the ischia) is an unchangeable measurement, 10+ cm. (4+ inches). At the outlet delivery is possible when flexion is present by the backward movement of the coccyx.

As the second stage of labor proceeds examination will reveal the fact that the head is descending through the pelvic cavity. If the

examining-finger be carried around the sides of the head, it is often possible to find the parietal eminences. If the finger be turned against the sides of the pelvis, the spines of the ischia may be recognized. It

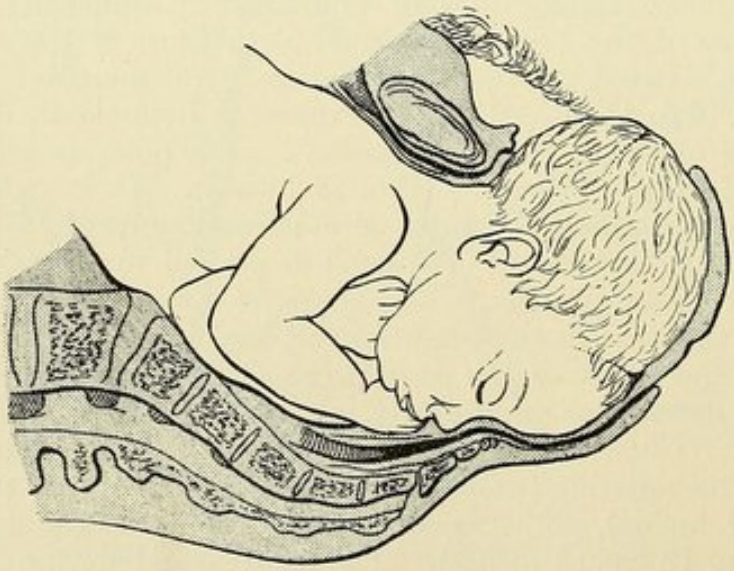
FIG. 65.



The cranium distending the pelvic floor. (FARABOEUF and VARNIER.)
B. Anterior fontanelle. *SO.* Suboccipital region.

is a clinical observation of practical value that when the head has passed with its parietal eminences the level of the spines of the ischia it has demonstrated the possibility of its normal exit from the pelvic cavity.

FIG. 66.

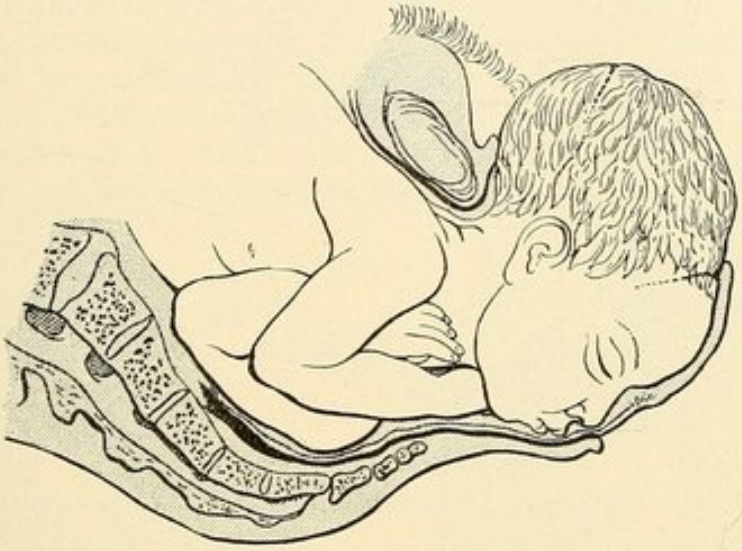


The cranium distending the pelvic floor. (FARABOEUF and VARNIER.)

As descent continues the head comes down upon the floor of the pelvis. It is found that little space is left for the finger to reach the anterior fontanelle. The vertex gradually turns from left to right until the occipital bone enters beneath the pubic joint. The posterior

fontanelle is then in the middle line of the pelvis, and rotation is complete. As labor proceeds the vertex sinks lower and lower. The swelling of the scalp known as the caput succedaneum becomes larger, and finally the scalp is visible between the labia. As the head descends the vertex fills the vulva, while the face remains partially upon

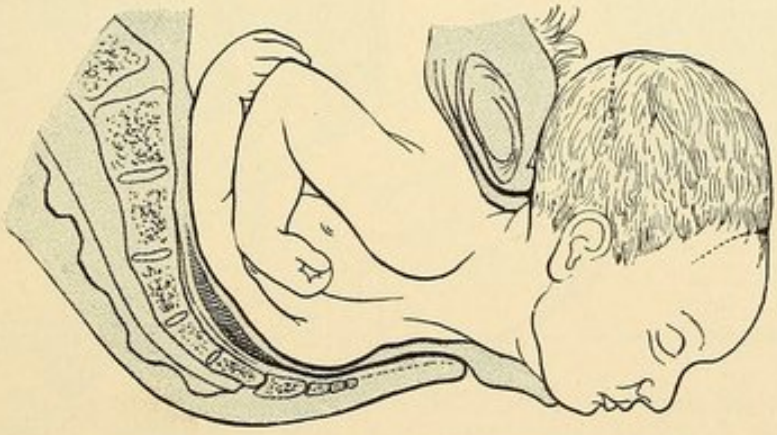
FIG. 67.



The expulsion of the head, the face passing over the pelvic floor. (FARABOEUF and VARNIER.)

the pelvic floor. Under the influence of a reflex stimulation from stronger pains the head passes through the vulva and emerges from the perineum, the vertex turning toward the side toward which it pointed while within the pelvis.

FIG. 68.



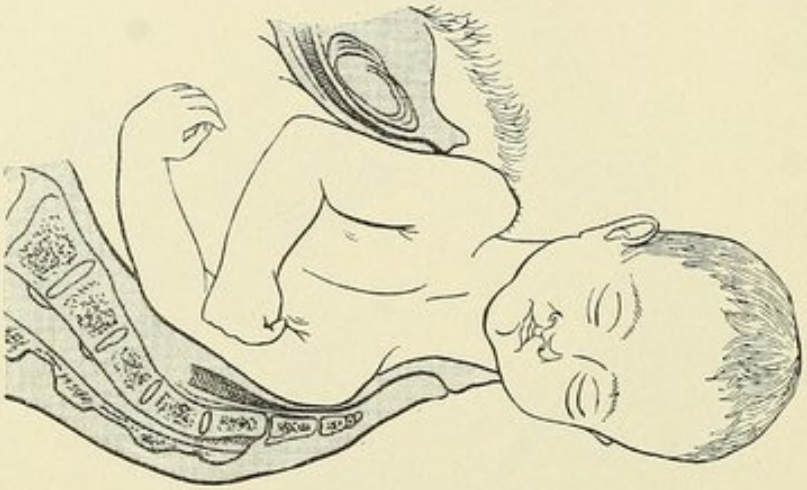
The birth of the head. (FARABOEUF and VARNIER.)

The shoulders of the child descend through the pelvis until the left or posterior shoulder has reached the pelvic floor. The resistance which it there meets causes the descent of the right shoulder, which is anterior, and this shoulder gradually emerges beneath the pubic joint. It is usually delayed beneath the pubes by lateral flexion of the trunk, which enables the posterior or left shoulder to pass over the

perineum. When the shoulders are born the hips and legs of the child pass readily out of the birth-canal.

A sign of the third stage of labor is the shape of the abdomen, which contains a tumor above the pubes as large as two fists. Ex-

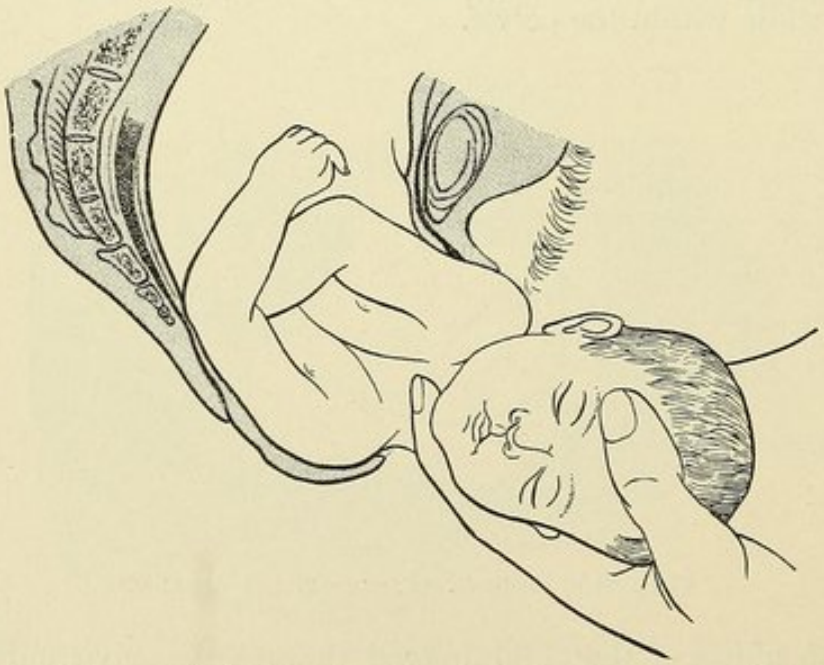
FIG. 69.



Right shoulder engaging beneath pubes. (FARABOEUF and VARNIER.)

pulsive efforts usually cease after the birth of the child. There is a slight discharge of blood from the vagina, while the presence of the umbilical cord shows that the placenta is within the uterus. After a

FIG. 70.



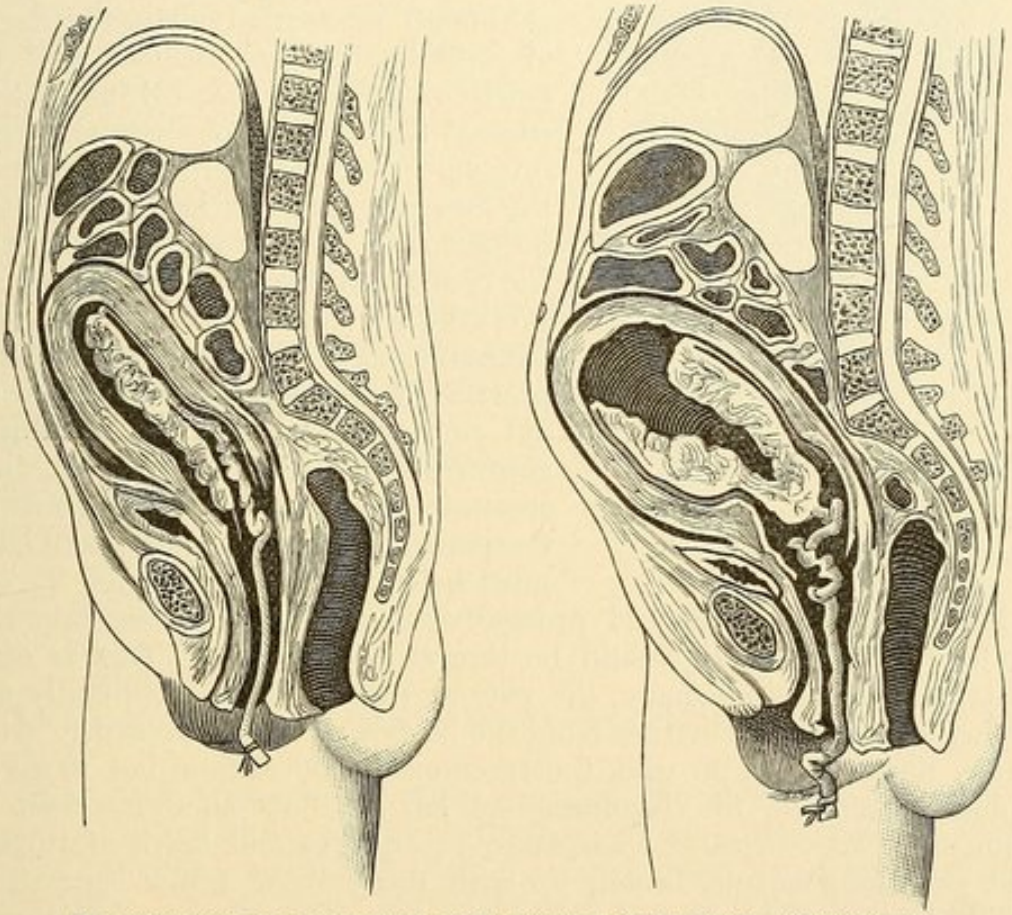
Aiding the delivery of the shoulders by raising the head. (FARABOEUF and VARNIER.)

variable time, which depends upon the patient's degree of exhaustion, uterine contractions again occur. The patient contracts her abdominal muscles strongly. The placenta becomes separated from the wall of

the uterus by uterine contraction and the formation of blood-clot between the placenta and uterine wall. The placenta presents at the vulva by one edge, with its fœtal surface anterior, and is expelled folded together upon itself. The membranes form a cord behind the placenta.

Cases are sometimes observed in which it is necessary to exercise caution in diagnosticating the existence of the third stage of labor. In cases of illegitimate pregnancy, where the patient conceals her condition as long as possible, the physician may be summoned after the removal of the child, when the cord has been cut off or where a portion of the placenta has been removed. A twin-pregnancy may have been present, and one placenta may have been expelled, while the other

FIG. 71. FIG. 72.

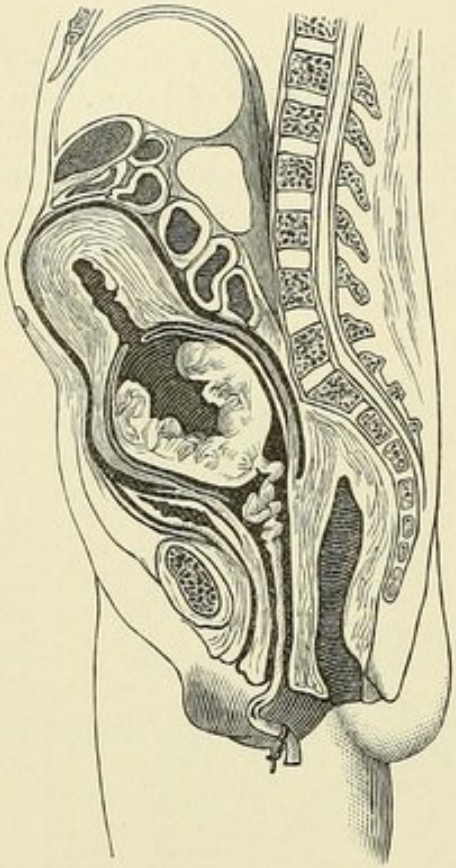


The separation and compression of the placenta in the uterus. (SCHROEDER.)

remains. In very rare cases, where the fœtus has been decomposed, a portion of its body is left in the uterus with the placenta. It is necessary invariably to examine all cases having enlargement of the abdomen, or vaginal bleeding, by combined vaginal and abdominal examination. In suspicious cases the vulva and vagina should be inspected, and bleeding, lacerations, membrane, or cord, or placenta, should be seen and noted. The vagina should then be thoroughly douched, and the physician should make a thorough examination with the aseptic hand. If the os is tightly closed and other evidences exist of recent labor, with retained placenta, the os should be dilated with the fingers

or dilators, the uterus thoroughly douched and examined to ascertain the presence of placenta, membranes, or blood-clot within its cavity. The statements of the patient or of those about her are of no value in these cases, because of the frequent attempt to deceive and conceal.

FIG. 73.



The placenta in the lower uterine segment just before expulsion. (SCHROEDER.)

The care of the patient during labor or the management of normal labor demands watchfulness and patient observation. It must be remembered that the process of labor requires prolonged and more or less severe muscular exertion, and this in addition to the suffering which the patient experiences. Although in normal birth the degree of suffering and excitement will not reach surgical shock, still no patient passes through labor without great fatigue. It is then imperative that at the first symptoms of labor the patient be placed in the best possible condition for birth, and that during this process everything be done to sustain her strength and lessen her suffering. The practice of leaving cases of labor without care until possibly the membrane ruptures is certainly negligent, and accounts for some of the cases in which the patient becomes exhausted and labor must be ended by instruments.

In order that labor should proceed without delay it is necessary that the bladder and rectum should be thoroughly emptied. This is often accomplished spontaneously, the patient passing urine frequently and having a copious evacuation from the bowels as labor proceeds. It is better, however, not to wait for spontaneous defecation, but to give a copious enema at the beginning of labor. This should consist of castor-oil, two ounces, hot soapsuds, two quarts, and spirit of turpentine, two teaspoonfuls, beaten up with the yolk of a raw egg. This should be thoroughly stirred and given to the patient at a temperature of 110° F., the patient lying upon her left side and the enema being passed as high as possible. This will secure a prompt and thorough evacuation.

The patient's dress should be loose and comfortable and sufficiently warm. A night-dress may be worn, with long woollen stockings and slippers, and a woollen dressing-wrapper. The patient's hair is often conveniently braided. An old night-dress is often chosen, which may be torn or cut off if necessary. Her bed is prepared by making it double, first with rubber sheet and draw-sheet, and over that another sheet, rubber sheet, and draw-sheet. A single light blanket is usually sufficient, with a sheet, for covering. A spread is unnecessary and in the way.

During the first stage of labor the patient is frequently nauseated and may vomit. She cannot retain a large amount of food, and yet she should not pass through a prolonged period of muscular exertion without nourishment. The most digestible and concentrated food should be given her in small quantities and at frequent intervals. Hot broth, milk, gruel, or egg beaten with milk or whiskey are useful during labor. She should be fed every four hours, the quantity taken depending upon her ability to retain it.

Much can be done during the first stage of labor to allay the mental suffering of the patient by kind and intelligent encouragement. She will naturally complain of pain which seems useless and without result. When the cause of this pain is explained to her and its purpose an intelligent patient will bear more cheerfully the first stage of labor. It is well to allow her to remain in a comfortable posture, and in first labors, especially, it is advisable to have the patient remain up and about her room until the second stage begins. This does not mean, however, that she is to walk about and exhaust herself in efforts to keep up. She may sit in a large chair or lie at intervals upon a couch, changing her position as desired.

As the first stage of labor often lasts from twelve to twenty hours in first labors, the patient will require sleep during this period. When evening comes her room should be darkened, she should be put to bed, and an effort made to procure sleep by giving a mild sedative. Hydrate of chloral is especially useful at this period of labor. It is convenient to give it in doses of ten grains each, dissolved in simple syrup and water.

The following will be found useful as a sedative in the first stage of labor :

Hydrate of chloral	grs. 160.
Bromide of sodium, Bromide of ammonium	each grs. 160.
Simple syrup.	℥ss.
Water to make	℥ij.

A teaspoonful every hour until three doses have been taken.

The nurse may be instructed to give the first dose at bedtime, repeating in an hour until in all three doses have been taken. Observation has shown that the action of chloral does not delay, but expedites labor. Some have obtained good results from the use of antipyrine or phenacetin, given in doses of five grains.

When a physician is summoned to a case of labor he may first find it necessary to make a diagnosis of the actual presence of labor. This can be done in two ways—by observing the presence or absence of uterine contraction and by an examination which will ascertain the degree of dilatation present. In patients who are excessively nervous, so that a thorough examination is difficult, a small quantity of chloroform or bromide of ethyl will be of great service. It is so important that the actual presence of labor can be recognized and its progress determined that partial anæsthesia is justifiable.

It is possible for a patient to simulate labor so perfectly as to deceive

a physician unless he makes an examination to confirm the diagnosis. While the presence or absence of uterine contractions can be proved by abdominal palpation, still an internal examination is necessary to ascertain the degree of dilatation which is present.

In the majority of cases the personal presence and assistance of the physician are needed from the time when the first stage of labor ends and the second begins. This period is announced by the rupture of the membranes and the partial escape of the amniotic liquid. The fœtus after this time is subjected to direct pressure, and hence may be in danger if labor is delayed. The soft parts of the mother are also subjected to pressure as soon as the membranes rupture, and destruction of tissue may result. The physician should study the passage of the fœtus through the pelvis and observe the strength or weakness of the uterine contractions, in order that he may intelligently protect the interests of both mother and child. During the first stage of labor his presence in the sick room will be rarely required for more than brief intervals, but while the expulsion of the child is taking place he should be present.

The most favorable posture for the patient during the second stage of normal labor is that of lying upon her left side, her hips at the edge of the bed, her thighs flexed, and her legs flexed upon the thighs, while her shoulders are turned toward the opposite side of the bed. Her face is turned away from the physician, who should sit at the right side of the bed, facing the patient's feet, so that with his right hand he may support the perineum at the moment of birth. If the bed be a narrow one, the nurse may stand, until the child is born, upon the opposite side of the bed from the physician, near the patient's head, where she can conveniently administer an anæsthetic. If the nurse is not experienced in the giving of chloroform, the anæsthetic may be retained by the physician himself, and the nurse may stand behind him, holding the chloroform-mask or the napkin upon which the physician may pour the quantity of chloroform which he wishes the patient to have. In this way the amount of anæsthetic administered is regulated entirely by the physician. As soon as the birth of the child occurs the nurse leaves her station and attends to the care of the infant.

Unless the physician has arrived in the presence of a critical emergency, there is no excuse for lack of thorough preparation as regards antisepsis. If the patient is healthy, she requires no preliminary vaginal douche before labor. Before each examination the attendant must scrub his hands thoroughly with soap and hot water, using a nail-brush; then rinse them thoroughly in hot water, and then scrub them in bichloride of mercury solution, 1 : 1000. No lubricant is required in normal cases for the finger, for the increased secretion of mucus renders this unnecessary. When it is evident that the second stage of labor is in full progress the physician, seated by the bedside, should have within reach a basin containing a pair of blunt-pointed scissors, three pairs of hæmostatic forceps, a small English catheter, a pair of long uterine dressing-forceps, ligature material for the cord, which should be preferably silk. These articles should have been thoroughly scrubbed and placed in solution of carbolic acid, 5 per cent., or creolin, one

teaspoonful to the pint. A second basin should be within easy reach filled with solution of bichloride of mercury, 1 : 2000, and containing absorbent cotton or pieces of old, clean linen. There should also be at hand fluid extract of ergot or ergotin, whiskey or brandy, strychnine pellets for hypodermatic use, and a hypodermatic syringe in good order. A small package of aseptic gauze, unopened, should also be ready in case it is necessary to tampon the uterus for hemorrhage. The nurse should see that an abundant supply of hot water is ready, and that a dry, warm blanket is prepared to receive the child. She should also prepare a clean cup or small bowl filled with saturated solution of boracic acid, in which are immersed a dozen pieces of old, soft linen. She should also have ready a roll made of a folded pillow or a blanket to place between the patient's knees. Beneath the foot of the bed, near the physician, should be a receptacle for waste-material, and also a basin and a towel for the placenta. As normal labor proceeds the physician, having thoroughly cleansed his hands, seated beside his patient, should examine her sufficiently often to note the advance of the child or its failure to do so. His left hand is conveniently placed to palpate the uterus from time to time, observing the character of its contractions and the descent of the child.

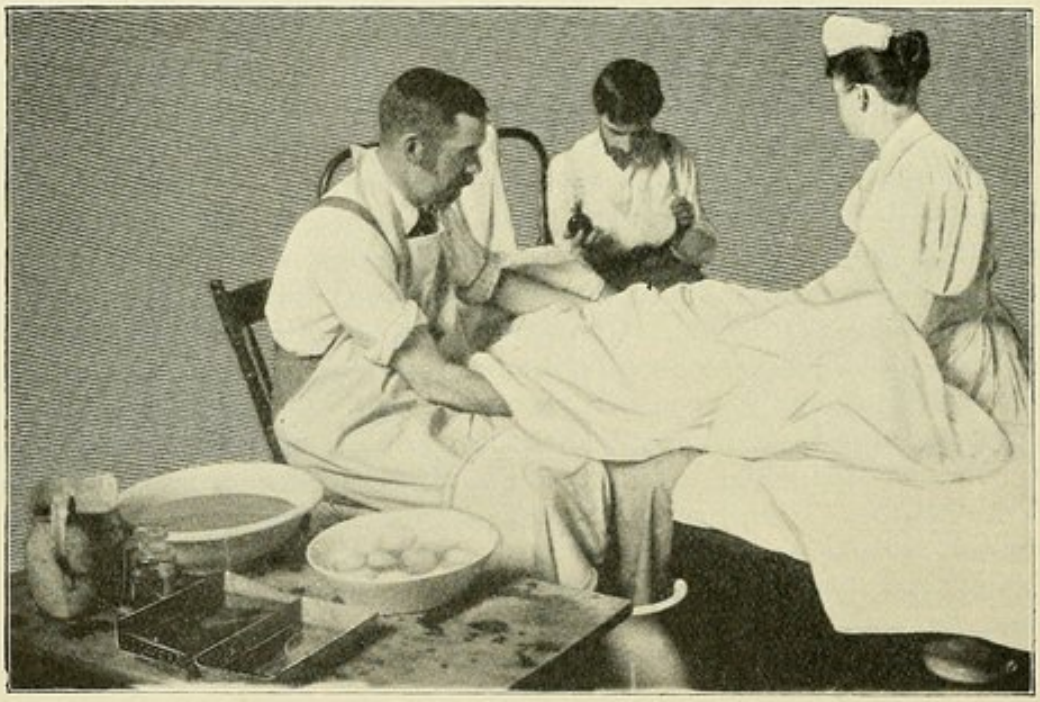
A physician who is experienced in abdominal palpation can follow the course of labor by this means in a very satisfactory manner. The head of the fœtus can be felt to descend into the pelvis. As labor proceeds the back and shoulders of the child gradually descend, while the hand placed upon the uterus during a pain can appreciate in this way better than in any other the strength of the uterine contractions and their increase or diminution. Symptoms of delay or exhaustion during labor can be more readily appreciated by palpation than by any other method. This procedure has the great advantage of very greatly diminishing the number of vaginal examinations, thereby lessening the danger of septic infection. It is also less disagreeable to the patient, and gives the physician much better information regarding the state of the uterine muscle than can be obtained in any other way.

The question of the use of anæsthetics in normal labor has occasioned much discussion. Complete anæsthesia is not required in normal labor; but there is no reason why the pains of the second stage of labor, even in normal cases, should not be lessened by partial anæsthesia. There is less danger of the tearing of the perineum and less danger of injury to the child if an anæsthetic be used. During the first stage of labor the patient will constantly request that something should be given her to relieve her pain. If she has ever taken an anæsthetic, she will beg that anæsthesia be afforded her. It is never safe to give the patient in labor an anæsthetic unless her labor is so far advanced that she can be delivered, if necessary, under anæsthesia. She will often be greatly comforted, however, if she is allowed to inhale sufficient anæsthetic vapor to benumb slightly her sufferings, and also to lead her to believe that she is obtaining an anodyne. This is often accomplished by adding to spirits of cologne a small quantity of chloroform, so that the odor of the cologne is slightly altered. A few drops of this on a handkerchief, when inhaled, have very feeble

anæsthetic power, but lead the patient to believe that she is receiving an anæsthetic. Patients can sometimes be made to suffer less by causing them to breathe deeply and rapidly, when a condition of partial apnœa results, in which their suffering is less acute. It is, however, a most unwise thing to yield too promptly to the patient's wish for anæsthesia and to allow the labor to be delayed by the premature administration of ether or chloroform.

Obstetric nurses should be trained to give anæsthetics in the manner which is necessary in obstetric practice. Chloroform is the best anæsthetic for normal cases of labor, but should not be administered until the second stage is well established. It may then be intrusted to the nurse, who will pour a half-teaspoonful upon a napkin and allow the patient to inhale it at the height of her pain. As the birth proceeds the physician will inform the nurse when the expulsion of the head is expected. When the head distends the perineum the pains are commonly made much more severe by reflex stimulation. This leads to severe expulsive pains, in which the head may be forcibly expelled. When this process begins the anæsthesia should be sufficiently advanced to lessen the violence of expulsive effort.

FIG. 74.

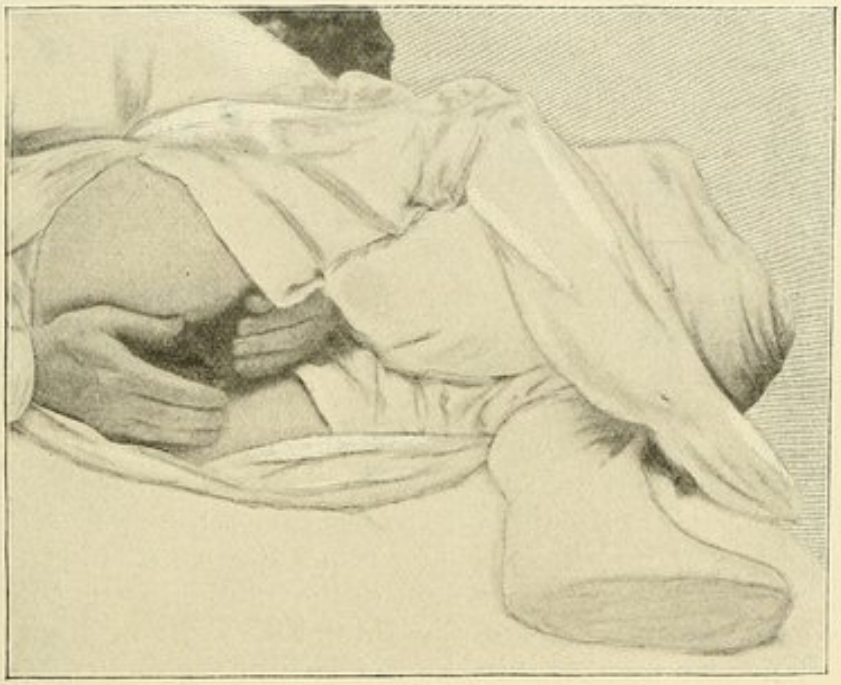


Making a vaginal examination in normal labor.

The physician will keep the parts thoroughly aseptic by frequently cleansing them with cotton or soft linen taken from the basin containing the solution of bichloride of mercury, 1 : 2000. When the vertex appears between the vulva the roll should be placed between the patient's knees, thus raising her upper, right thigh. The physician should then pass his left hand over the patient's abdomen and between her thighs, so that his fingers may rest upon the vertex of the fœtal

head. With this hand he may govern the rate of expulsion of the head, maintaining flexion at the same time. The other, his right, should be thoroughly wet in the 1 : 2000 bichloride solution and then be laid transversely across the pelvic floor, the ulnar portion of the hand covering the anus. The radial border of the hand should be a half-inch to three-fourths of an inch below the posterior commissure of the vagina. As the head descends to the pelvic floor the right hand will support the pelvic floor, but should leave the edge of the perineum at the commissure free to dilate, or, if needed, to tear.

FIG. 75.



Protection of pelvic floor and delay of fœtal head.

Experience has shown that where the birth-canal is not well developed, or where the head is large and a tear is inevitable, it is better to have this lesion occur in the median line than to have the pelvic floor injured, while the skin of the perineum may remain intact. As the head descends and rotates upon the pelvic floor the vertex will gradually emerge until it is evident that, unless opposed, the head will soon escape from the vulva. There is least danger of tear if the head be expelled between the pains. With his left hand the physician can regulate the advance of the vertex, while with his right he protects the pelvic floor. Should a sudden expulsive effort be made he may slip one hand over the other, covering the vulvar orifice with both, thus preventing expulsion at that moment.

When he decides that sufficient dilatation has taken place, and that the head may be born in the next pain, the anæsthetic should be given sufficiently freely to abolish the sensation of pain. It is proved by the statements of patients that while they do not feel the actual passage of the child from the body, they hear and remember what is said about

them and know perfectly where they are. This abolition of suffering with the retention of consciousness is rarely seen except in labor, and may be termed obstetric anæsthesia. With the patient in this condition the physician may allow the head to emerge as far as he chooses, governing its exit by the left hand, while with the right he cautiously works the perineum and pelvic floor backward from the forehead. The head, after it emerges, will turn with its vertex toward the thigh, toward which it originally pointed. As soon as the head is born the nurse should see to it that the mouth is thoroughly cleansed with soft linen and a saturated solution of boracic acid. The same precaution must be taken in the care of the eyes as soon as the head is born. A slight pause usually occurs after the expulsion of the head. If a loop of cord is around the child, it must be loosened by gentle traction and slid over the body of the child.

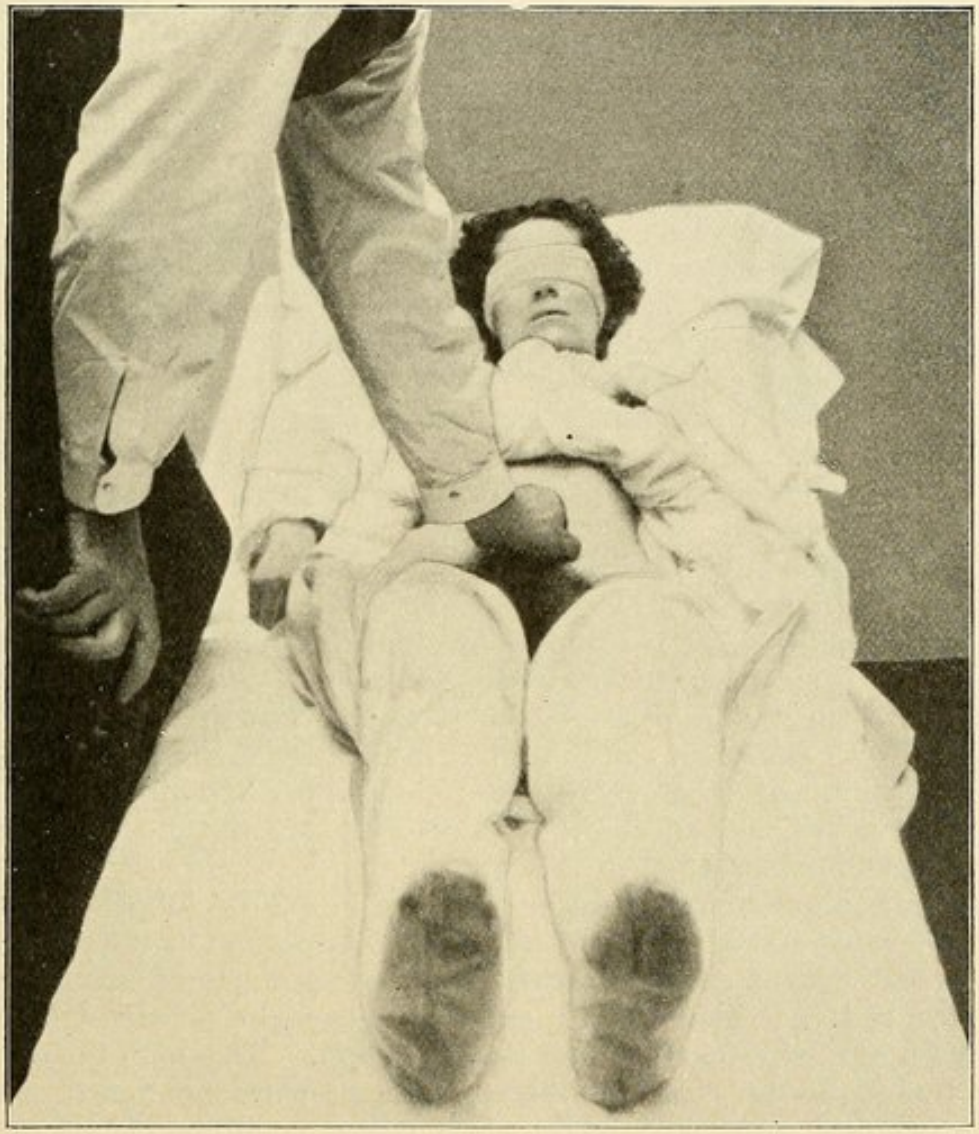
The birth of the shoulders is a procedure equally important with that of the head. The right hand should still be free to protect the pelvic floor, while the left hand may grasp the fœtal head beneath the jaw and with the occiput also included in this grasp. The head should be raised toward the abdomen of the mother. If no uterine contractions occur immediately, the physician may excite them by rubbing or kneading the uterus with the elbow of his left arm. The anæsthetic should still be in readiness, as the patient will often, by a sudden effort, force the shoulders out and tear the pelvic floor. As with the birth of the head, so with the shoulders: a mild degree of anæsthesia will enable the physician to prevent an injury.

When the head and shoulders have been born the rest of the child's body passes readily into the world. When the child is born it should lie upon its right side, close enough to the mother so that no traction be made upon the cord. The mouth and eyes having been cleansed, the physician or nurse should take the cord in the fingers and note its pulsations. There is abundant evidence to show that it is better for the child to allow the cord to stop beating before tying it. Several minutes often elapse before the beating of the cord ceases. When this occurs it should be firmly tied three fingers'-breadth from the child's navel. A second ligature is applied on the placental side, about an inch from the third. The cord should then be cut with blunt-pointed scissors and the child removed and wrapped in the blanket warmed for it. The mother may then turn upon her back for the completion of labor in the third stage.

Ordinarily the separation of the placenta is caused by the growing smaller of the uterus and by the intervention of clotted blood between the placenta and wall of the uterus. This process, occurring gradually, requires some twenty minutes or half an hour for its completion. During this time the patient may complain of no pain, although the uterus contracts at varying intervals. The left hand of the physician should rest upon the uterus to ascertain positively that it is properly contracted. When the patient complains that she is having more pain she should be urged to bear down, for observation shows that the placenta is delivered, not by contractions of the uterus, but by the abdominal muscles. The physician may aid the expulsion of the placenta by

taking the womb in his hand as well as the abdominal wall will permit, his fingers being passed down behind the fundus of the womb in the median line at the brim of the pelvis. The muscles above the thumb should press upon the anterior surface of the womb in the median line. By squeezing the womb when the patient has expulsive pain the delivery of the placenta will be hastened. The placenta will appear at the vulva, presenting by its fœtal surface and generally

FIG. 76.



Compressing the uterus after labor.

folded together like a broad leaf folded once or twice upon itself. It may then be grasped by the fingers and gently removed, care being taken not to tear the membranes. The nurse should hold the basin for the purpose at the edge of the bed to receive the placenta, covering the whole with a towel and saving the placenta for examination. When the after-birth has been removed the physician will do well to take away any blood-clots which may remain in the vagina, and also to assure himself that no membranes or blood-clots of size remain within

the uterus. Before the introduction of the hand into the vagina it must be thoroughly rinsed in bichloride solution. The left hand of the physician should remain upon the abdomen and uterus to determine the condition of the womb. In normal cases the womb remains, while contracted, just upon the brim of the pelvis. In perfectly normal patients it is unnecessary to give ergot immediately after labor, as the uterus will contract without it. It is, however, a safe precaution to administer a teaspoonful of the fluid extract of ergot when the uterus has been emptied.

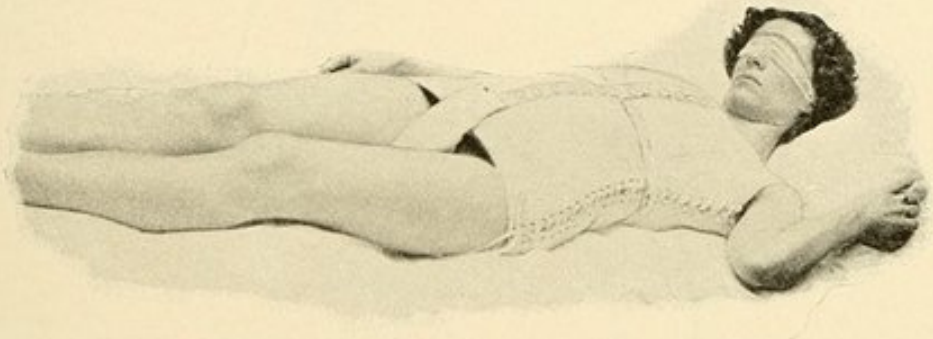
The care of normal labor is not complete until the patient has been made clean and aseptic and until the physician is assured that no laceration requiring suture has occurred. As soon as the labor is over and the womb well contracted it is proper to give a copious vaginal douche of bichloride solution, 1 : 4000. This should be given at the temperature of 110° F. and in quantity not less than two quarts. A new fountain-syringe is to be used, the bag of which should be held not more than three feet above the patient's head. The external parts should be thoroughly cleansed with bichloride solution, 1 : 2000. To determine the presence or absence of lacerations examination should be made by sight and by touch. Experience has shown that clotted blood may adhere to a lacerated surface, giving the feeling to the finger of sound tissue. It cannot be too strongly stated that it is the positive duty of the physician, and of no one else, to make such examination, and, if necessary, to settle this point. The statement of those who assert that they have had thousands of cases of labor without laceration proves that they at least made no adequate examination to discover the condition. To examine by sight the patient may be turned upon her left side, the parts exposed, and then, if needed, a candle may be used to furnish light, while the physician inspects the vulva, and sponges, with absorbent cotton dipped in bichloride solution, 1 : 2000, the perineum. If he suspects a laceration higher up, which is not visible from below, he may insert his finger into the rectum and raise the pelvic floor for inspection in this way.

Before the question of treating a laceration can be solved it is well to define what should be meant by the term laceration of the perineum. It has been often seen that in perfectly normal labor the fourchette may be torn and the tissue beneath sufficiently to make a tear of between one-half and three-fourths of an inch in extent. This is in the median line, and if the tear extend no higher than the parts mentioned, it is of little practical importance as far as the future condition of the patient is concerned. In a perfectly healthy woman after her first labor, if she has proper care to maintain cleanliness, it is not necessary to close such a laceration, because it involves no tissue concerned in maintaining the position of the uterus. In hospital practice, among persons of uncertain character, the laceration, no matter how small, should be closed under antiseptic precautions. Small tears which do not require sewing should be kept powdered with a mild antiseptic. In hospital and in private cases boracic acid may be used. We must again call attention to the fact that after every normal labor the physician should examine his patient to ascertain the presence or absence of laceration. No case

can be considered normal unless such examination has been made and the absence of laceration proved.

The care of normal labor is not complete without the application of proper dressing to the vulva and thorough examination to determine the presence or absence of bleeding and of shock. The vulva must be covered with an antiseptic absorbent dressing, which is removed and burned when soiled. This may be composed of cheesecloth soaked in bichloride solution, 1 : 2000, or any suitable material thoroughly impregnated with an antiseptic. Over this pad should be applied a T-bandage or a slip pinned to the binder to retain the pad in place.

FIG. 77.



Vulvar, abdominal, and breast dressings applied.

While the abdominal binder is not necessary with young women after the first confinement, it is often useful with weaker patients to keep the abdominal muscles quiet and support relaxed tissues. The physician will determine the presence or absence of bleeding by palpating the uterus and counting the patient's pulse and by inspecting the vagina. Should surgical shock be present, it must be treated with strychnine, one-twentieth grain, hypodermatically. The patient should be placed in warm, dry clothing, upon perfectly clean linen, and care taken to see that her feet and legs are warm. She must be kept perfectly quiet and permitted to sleep as soon as possible.

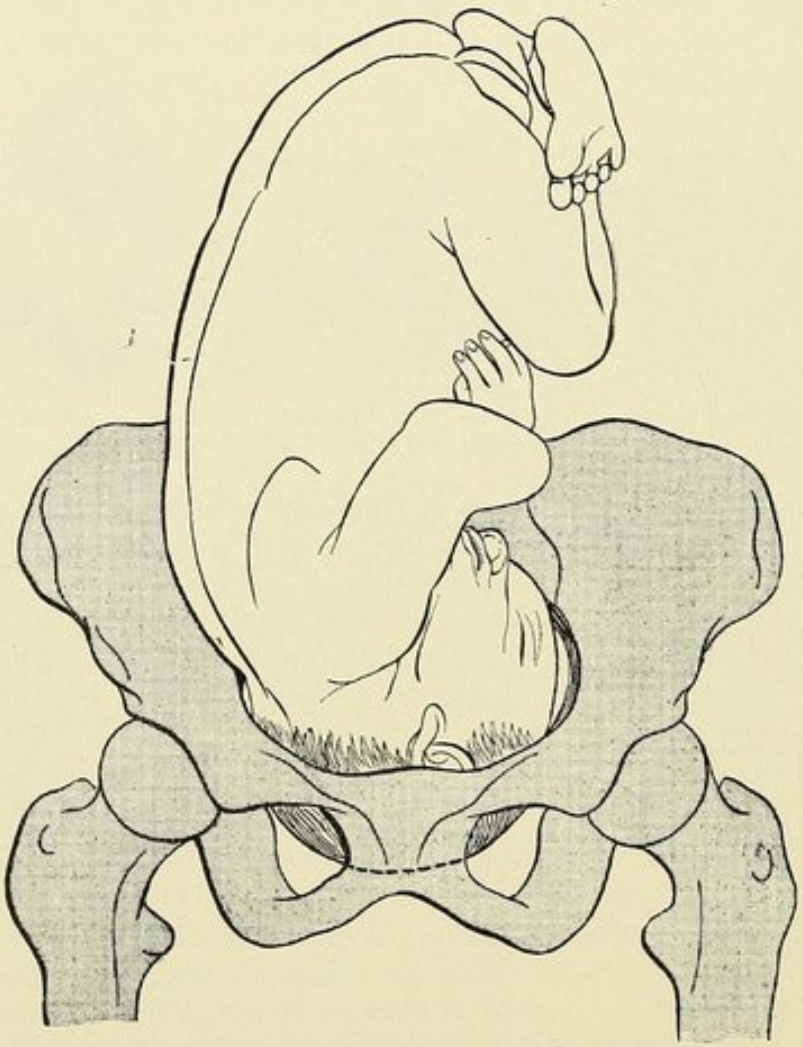
CHAPTER IX.

ABNORMAL LABOR: THE CRANIUM PRESENTING.

ALTHOUGH the vertex may present and labor-pains be good, and although the size of the mother's pelvis may be such as to permit normal labor, cases are seen in which the vertex fails to rotate to the front, thus occasioning an abnormality of importance. Cases in which the back is directed toward the mother's right side, and in which the occiput turns to the front, occasion no abnormality in labor.

The position of the occiput and of the back when directed toward the mother's right side form what is called a second position. A first position is the usual one, the back and occiput being directed toward the mother's left side. The second position is that by which the back and the presenting part are directed toward the mother's right side. The mechanism of labor in the second position, the occiput presenting, differs from that of the first position only in the fact that the presenting part and the trunk of the fœtus rotate from right to left, instead of from left to right. The causes which produce rotation are the same,

FIG. 78.



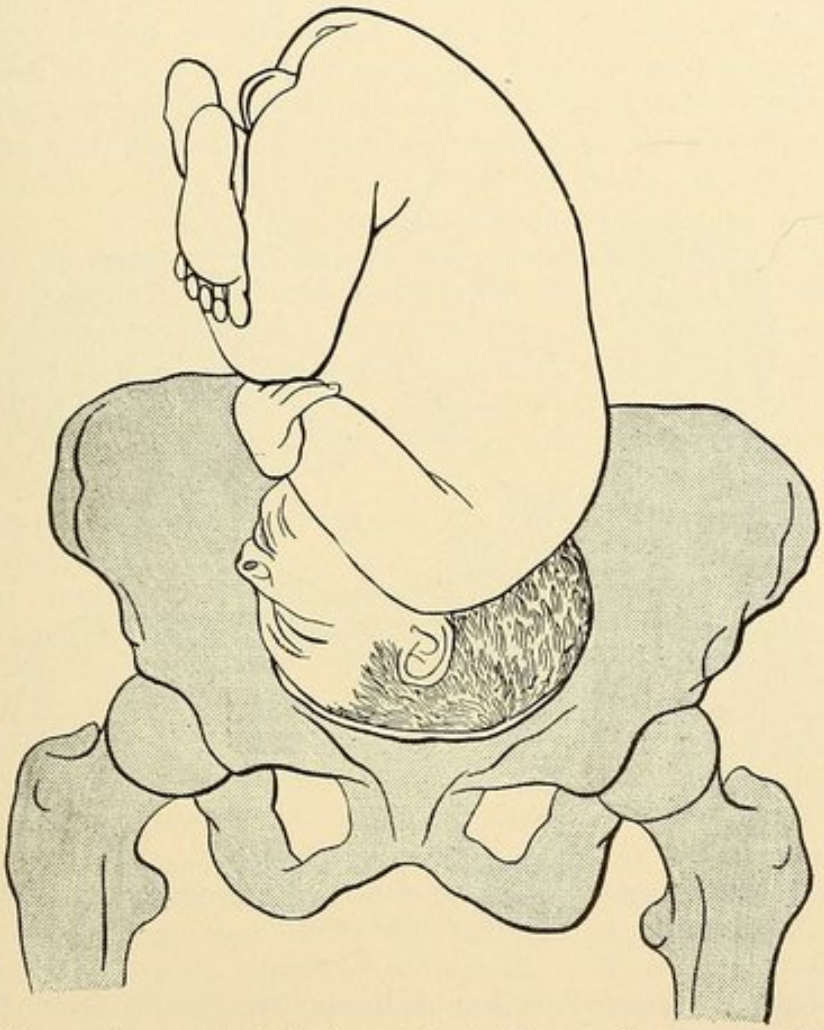
Vertex presentation, second position. (FARABOEUF and VARNIER.)

the phenomena of descent are the same; and in applying the forceps in such a case the operator must remember the reverse direction of rotation, but bear in mind that the mechanism is precisely that of the usual labor. In cases where the second position is present the presenting part is more apt, however, to turn posteriorly than in cases in which the first position is at hand.

It will be remembered that at the beginning of labor the vertex often occupies a position near the middle of the pelvic brim, being neither directly toward the pubic joint nor toward the sacrum.

When uterine contractions begin the occiput may descend, gradually turning behind instead of in front, until it reaches the pelvic floor behind the median line, transversely, of the pelvis. The cause of this abnormal rotation is a lack of proportion in size between the head of the child and the mother's pelvis. Failure in the head to flex perfectly also induces this abnormality. As the head descends the occiput finds most room on one side or the other of the promontory of the sacrum. The patient suffers more than usual as labor proceeds, because the large occiput is forced downward against the strongest and most unyielding portion of the pelvic floor. The first stage of labor is more prolonged and painful than usual, while the second stage is marked by greater suffering and by uterine contractions which seem less effective than in normal cases.

FIG. 79.



First position, vertex presentation before rotation has begun. (FARABOEUF and VARNIER.)

The physician will find, in palpating the abdomen, that he cannot distinguish the occiput in front, as in normal cases. The back of the child is less readily outlined, while the heart-sounds seem heard from a greater distance than normally.

On internal examination the vertex is found behind the median line of the pelvis, the smaller fontanelle being often so far back as to be

difficult of access. The larger fontanelle may be more readily felt, which is the exact opposite of normal labor.

When the head descends upon the pelvic floor in labor three factors are always necessary to secure anterior rotation of the occiput—one consists in the fact that there must be no *great* disproportion between the head and the pelvis; the head must be well flexed and the expulsive forces of the mother must be good. There must also be an elastic and resisting pelvic floor. When these conditions are present and the occiput

FIG. 80.

The most frequent posterior rotation of the occiput, vertex presentation, second position. (FARABOEUF and VARNIER.)

descends behind the median line of the pelvis, it may reach the pelvic floor without rotating. If, however, the greater part of the conditions are favorable for rotation, it may remain upon the pelvic floor for some time, but will finally turn to the front. Observation has shown that ninety-eight out of every hundred of these cases terminate by spontaneous rotation. When, however, the occiput remains upon the pelvic floor and rotation fails, if the pelvis is large enough to permit the birth of the child, the physician can supply those factors necessary for delivery which are lacking.

The management of these cases of abnormal rotation of the occiput depends upon the proper understanding of the condition.

If the physician observes that the head is descending through the pelvis, although progress may be slow, he should remember that spontaneous termination of labor is the rule, providing the patient's strength be sufficient. Such cases demand especial care to avoid exhaustion. The patient must be fed at regular intervals, stimulants being used with food if necessary, while fruitless efforts at straining and bearing down must be avoided.

The posture of the patient in these cases is of considerable importance. It has been found by observation that if the patient lies upon that side toward which the occiput is pointing, gravity causes the fundus of the uterus to fall toward the bed, thus rotating the lower portion of the womb and the head of the child in the opposite direction. If the occiput be found upon the left side of the patient's pelvis and behind, if she will lie upon her left side, her thighs flexed, the fundus of the womb will gravitate toward the bed on which she lies, while the head of the child will tend to move from left to right. Continuous pressure, as of a sand-bag laid upon the abdomen, will also favor rotation. This, however, is rarely advisable, and is unnecessary if gravity be utilized. The membranes should not be ruptured, but preserved as long as possible, as the presence of the amniotic liquid assists in rotation. Care should be taken that the patient secures sufficient sleep during the first stage of labor. As long as the membranes are unbroken delay will harm neither mother nor child. If the pains are severe and exhausting, if the mother be given one-eighth of a grain of morphine with atropine, by injection, she will sleep several hours and awake much refreshed.

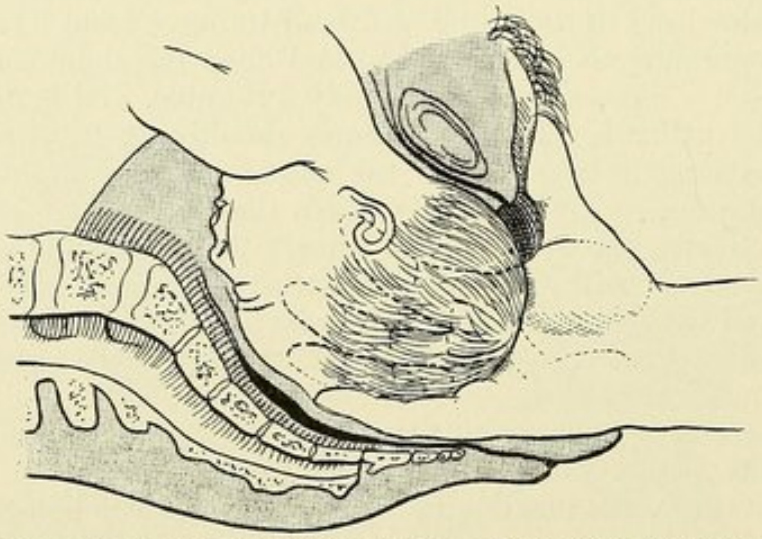
It is important in these cases that the bladder and rectum should be kept as empty as possible.

When, however, the membranes break and the second stage of labor is well established the patient will be the better for a tonic, taken with some form of nourishment. Quinine has proved a serviceable drug in maintaining general strength and good uterine contraction. It may be conveniently given in capsules, each containing two grains of quinine and one grain of scale pepsin. The administration of pepsin will often prevent the rejection of the quinine by vomiting, and will assist the patient in retaining a small amount of broth or milk taken with it. Four grains of quinine may be given every hour until twenty have been taken. Every two hours the patient may take a tablespoonful of whiskey with broth or mixed with milk. When the occiput turns to the front spontaneously rotation is usually attended by a very few strong contractions of the womb, which, occurring suddenly, rapidly change the position of the occiput.

When rotation has occurred labor terminates in the usual manner. When, however, rotation does not occur and the patient's strength is inadequate to maintain good contractions of the womb, the physician must supply the missing factors and assist in completing labor. He should prepare to apply forceps or to perform version, and for this purpose surgical anæsthesia is necessary. If he can have an assistant,

which is most desirable, ether should be given. If, however, he is alone, he can often succeed more easily by using chloroform. The forceps best adapted to such a case are Simpson's. They should be fitted for axis-traction. We have found the use of tapes, as first suggested by Poullet, most successful in these cases. The bladder should be emptied by catheter, and, if the rectum is not empty, an injection must be given. The patient should be placed upon her back across the bed, although it is advantageous in some cases to have her lie upon her side. The vagina should be thoroughly douched with creolin or carbolic acid, 2 per cent., and the patient anæsthetized. The physician must thoroughly cleanse his hands and make them aseptic in the manner described in treating of normal labor. He will require blunt-pointed scissors and instruments needed for sewing up the perineum and pelvic floor. These must be scrubbed with soap and water, thoroughly rinsed, and put in carbolic acid or creolin, 2 per cent. Upon making an examination the

FIG. 81.



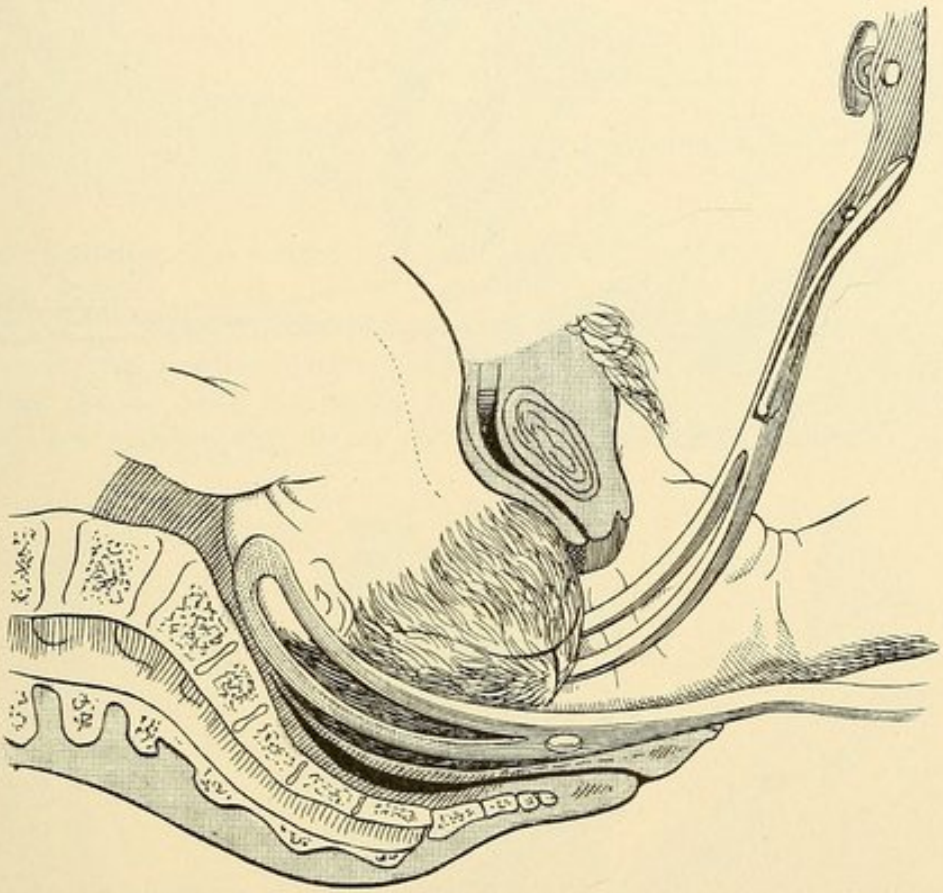
Manual correction of defective rotation. (FARABOEUF and VARNIER.)

hand should be gently introduced within the vagina. The head must be grasped by the thumb and fingers and a persistent but gentle effort made to turn the head so that the occiput shall go to the front. In some cases, with the patient under complete anæsthesia, this turn may be wholly or partially accomplished. If the physician can turn the head but a little, so that it remains obliquely in the pelvis, the occiput toward the front, he may then apply forceps while the head is in this position and proceed to deliver the child.

In applying the forceps in cases of defective rotation the aim of the physician should always be to fit them accurately upon the sides of the child's head. No effort should be made to rotate the head forcibly by forceps, for if the operator will content himself with making traction downward and backward in the pelvic axis, taking care to pull in the central line of the pelvis, he will find that the head and forceps will rotate without difficulty. The introduction of the forceps where the head is oblique is more difficult than where the head has rotated. It is sometimes possible to introduce the blades of the forceps obliquely

and to lock them without special difficulty. In other cases the forceps blades are introduced straight in the pelvis, each blade being rotated slightly until it fits upon the head of the fœtus. In other cases it may be most feasible to introduce the upper blade of the forceps first, having it held by an assistant, while the lower blade is introduced and both are cautiously locked. The entire manipulation should be done with great gentleness, and if it be found that the forceps cannot be readily fitted to the sides of the head, Simpson's forceps should be selected if they are not already in use. This instrument should be introduced straight in the pelvis, applied to the sides of the pelvis, and the forceps brought gently together without attempting to grasp the head

FIG. 82.



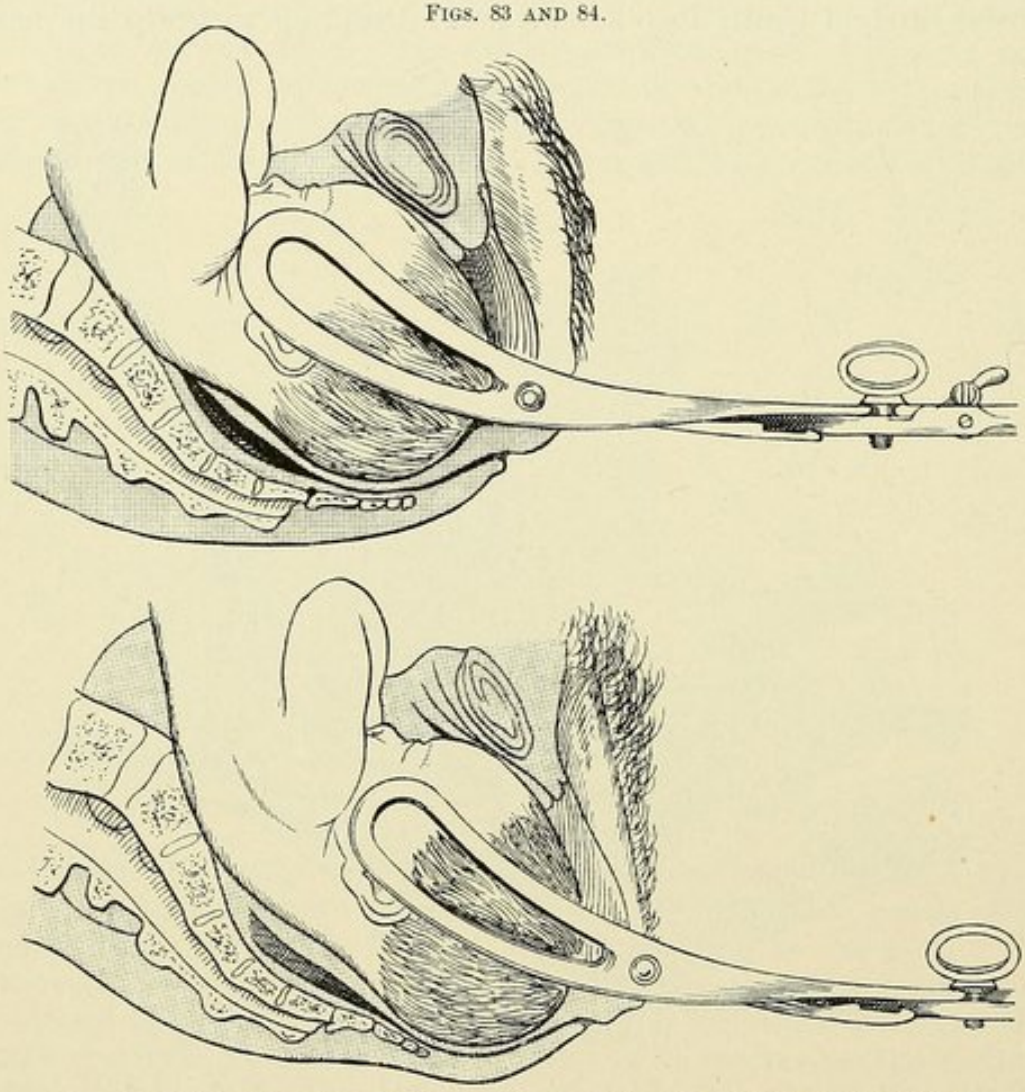
Forceps in defective rotation, the upper (right) blade introduced first.
(FARABOEUF and VARNIER.)

tightly, and traction should be made in the axis of the pelvis. Between the tractions the forceps must be relaxed to allow the head to rotate within the blades. If this manipulation be practised with gentleness and patience, it will require but a few tractions to cause the head to rotate, when the forceps will be found to fit accurately upon the sides of the head. If, however, the operator cannot turn the head, but finds that the occiput persistently rotates toward the sacrum, he must consider one of two courses of action. If the head is not firmly fixed in the pelvis, but can readily be carried up above the pelvic brim, he would be following the advice of excellent observers were he to perform podalic version. On the other hand, if the head be not very large and

the mother's pelvis ample, he may choose to make traction upon the head and deliver the child, the occiput remaining behind. There is no question that such delivery is possible in many cases. The mother, however, will sustain laceration of the pelvic floor and perineum, while the child's head may be considerably bruised.

In cases where the occiput can be brought but part way to the front by the hand rotation can often be effected by applying the forceps to the sides of the pelvis without attempting to lock them completely, making a gentle traction in the pelvic axis and relaxing the grasp of

FIGS. 83 AND 84.



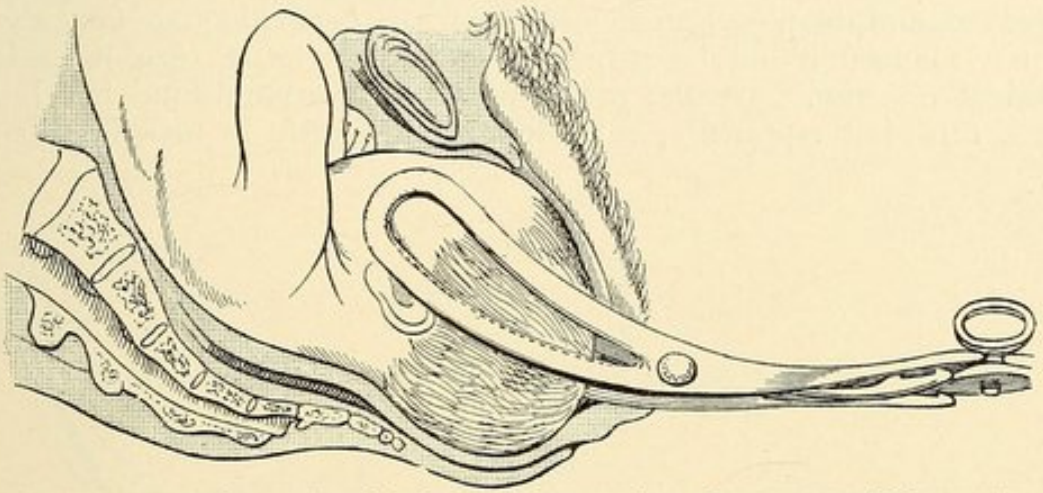
Forceps delivery in posterior rotation of the occiput. (FARABOEUF and VARNIER.)

the forceps between each traction. In this way the head is left for a period within the forceps, and in the majority of cases it will so rotate to the front. In cases where spontaneous rotation and expulsion do not occur the most desirable method of treatment consists in anæsthetizing the patient, introducing the hand, and turning the head of the child sufficiently to apply the forceps obliquely, with the occiput in front of the median line. The case may then be terminated as if the occiput had not turned behind. If, however, this is unsuccessful, the forceps must be applied to the sides of the pelvis and axis-traction

made at intervals, the forceps being loosened between each traction, so that the head may rotate within the instrument.

If the occiput rotate behind, traction should be made with the forceps downward and directly toward the operator until the forehead

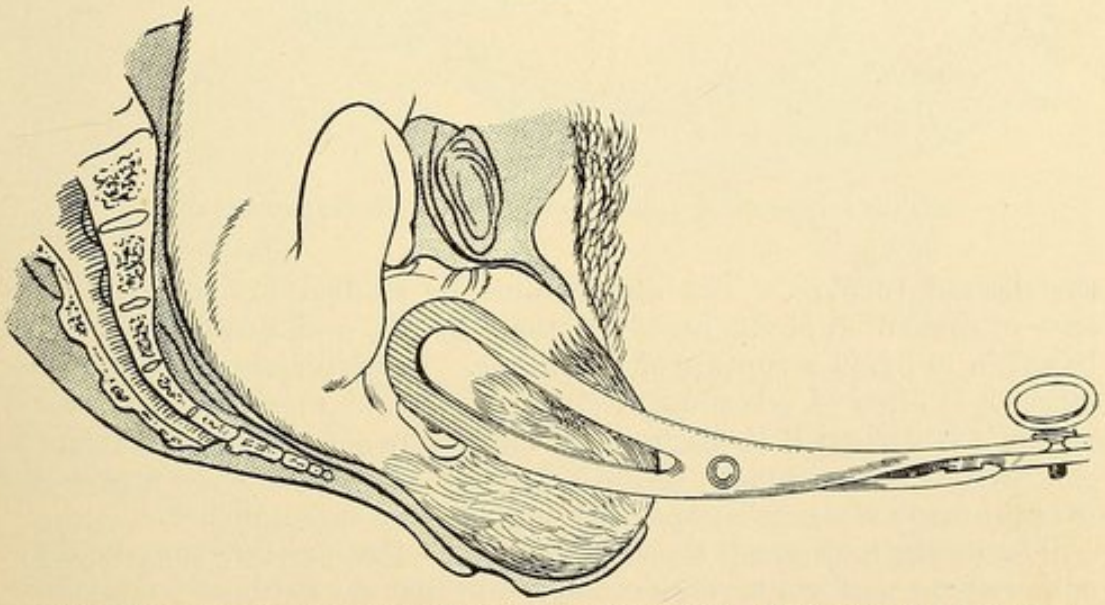
FIG. 85.



Bringing the head upon the pelvic floor, occiput posterior. (FARABOEUF and VARNIER.)

of the child comes beneath the pubic joint. The forceps should then be relaxed, the handles lowered, and a new grasp upon the head taken. Traction should then be made downward until the forehead is well beneath the pubic joint, when the handles should be carefully raised

FIG. 86.



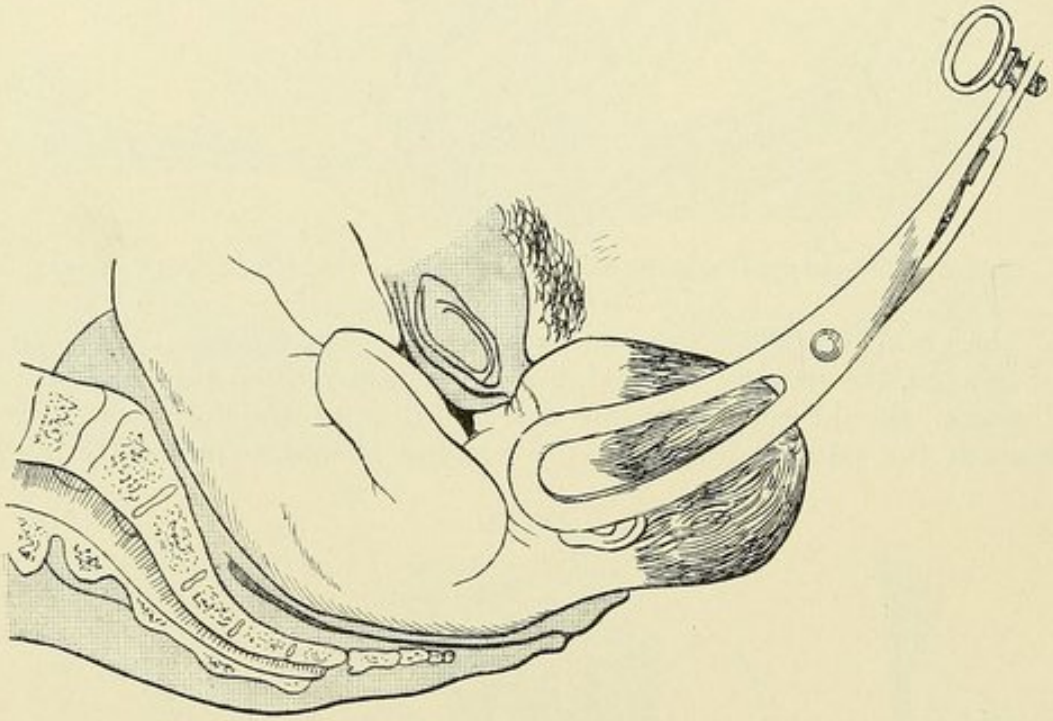
Raising the occiput over the pelvic floor, the occiput posterior. (FARABOEUF and VARNIER.)

and the occiput lifted over the perineum. An extensive tear may sometimes be prevented by double episiotomy.

Attention has been called to delay in the delivery of these cases caused by failure of rotation in the body and shoulders of the child. Failure of the body and shoulders of the child to rotate may arise from

spasmodic contraction of the uterus, which may be in a condition of tetany, or from excessive size of the shoulders and body. Whatever may be the condition present, an effort should be made, under chloroform-anæsthesia, to bring about a partial rotation of the trunk by manipulation. Care should be taken that the bladder is empty. The patient's thighs should be completely flexed and she should be anæsthetized, and the physician should grasp the trunk, having first accurately mapped it out by palpation, and endeavor to turn it in the desired direction. Gentle, persistent efforts, accomplishing but little at a time, but repeatedly, will often assist greatly in bringing about

FIG. 87.



Birth of head by forceps, occiput posterior. (FARABOEUF and VARNIER.)

the desired turning. The uterus must be studied to detect the presence of distention of the lower uterine segment, and great care should be taken to avoid a rupture of the uterus. In performing this manipulation it is often of advantage to turn the patient upon the side toward which it is desired that the back and shoulders should turn. The force of gravity is thus brought to the aid of the manipulation, and progress is often made when otherwise nothing could be accomplished.

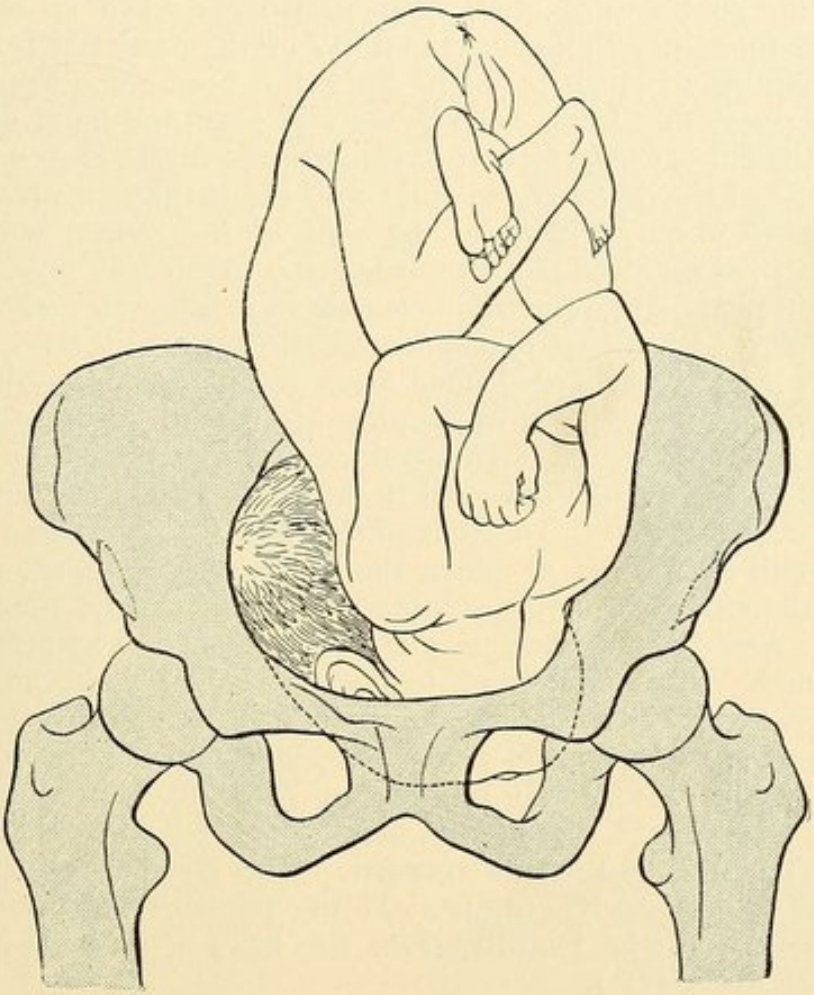
The uterus may grasp the trunk so firmly that delivery may be difficult without performing craniotomy, emptying the skull, and delivering the head with a cranioclast under complete anæsthesia.

In most cases in which the occiput is delivered behind the pelvic floor will be torn to the rectum. Unless the patient suffers from collapse or shock this injury should be at once repaired. In laceration which is extensive it will be found advisable to suture the vagina with strong catgut, burying it in the tissues or using the continuous suture. If the skin be broken, the tear should be closed with silkworm-gut,

and especially with stitches which bring together any torn portion of the sphincter muscle of the bowel.

The child's face, where delivery occurs without rotation, is often considerably bruised, the forehead, having been beneath the pubic joint, being especially injured. Although both eyes may be swollen shut, serious injury to the eyes is very rare. If strict cleanliness be maintained, with applications of hot water, children recover, as a rule, without deformity.

FIG. 88.



Head impacted, occiput posterior. (FARABOEUF and VARNIER.)

It will usually be necessary in these cases to remove the placenta manually, for the patient will usually lack spontaneous uterine contraction. Her risk of hemorrhage and septic infection is greater than in normal labor, and calls for greater care on the part of the attendant.

Cases in which the head presents with one parietal bone at the centre of the pelvic cavity are termed parietal bone presentations. They are often seen in contracted pelves in which the head endeavors to enter the pelvis in the usual manner, and, failing in this, turns across the pelvis.

By palpation the physician will find the occiput upon one side of the entrance to the pelvis, while the chin and face are upon the other. In the centre of the pelvic cavity the parietal bone will be found, having

rotated from above downward to the centre by lateral flexion of the head upon the trunk. This oblique position of the head upon the trunk is always present to some extent in labor when the head presents. It commonly, however, offers no obstruction to delivery, and is often not detected in normal labor.

In the majority of cases it is the right parietal bone which most commonly presents. The course of labor in these cases is prolonged and more painful than usual. As the head fails to proceed into the pelvis, flexion becomes lost and the head lodges in the manner described. The uterine contractions often become stronger when an obstacle to delivery is present. Following the delay of the head the patient may have strong pains which serve to force the head more fixedly in its abnormal position. If the head is not dislodged and labor allowed to proceed, the patient may become exhausted, the uterus is in a condition of tetany, and the death of the child may result through pressure. If labor-pains continue, the lower segment of the uterus will become drawn out over the head and rupture of the womb may occur.

The treatment of this condition consists in making an early diagnosis by palpation. By internal examination it is evident that, to secure relief, the head must be dislodged from its abnormal position. The simplest procedure consists in pushing up the chin, causing flexion to become again established. This will convert the presentation into a vertex and allow labor to proceed if the pelvis be not so contracted as to make it impossible. To accomplish this the patient must be anæsthetized with chloroform or ether, the vagina made aseptic, the hands of the obstetrician thoroughly scrubbed, and the patient placed across the bed. Axis-traction forceps must be at hand and asepticized. If the uterus is in a condition of tetanic contraction, chloroform is the better anæsthetic. The hand should then be introduced gently into the vagina and the head sufficiently grasped to estimate its size and its relations to the pelvis. By pressing up with the external hand upon the trunk of the child, the internal hand may also endeavor to dislodge the fœtus by pressing the chin upward. This should cause the vertex to descend into the pelvic cavity. If the patient's condition demand it, the forceps must be applied before the hand is removed and labor ended. (Plate VIII.)

If this effort be unsuccessful, an effort may be made to convert the presentation into one of the face. To accomplish this the opposite manœuvre must be executed. The vertex must be pushed upward and the chin allowed to descend. By rotating the chin toward the front and stimulating labor-pains the patient's delivery may in some cases be effected.

In flat pelves, if the head can be dislodged, podalic version may be performed. This, however, will not be possible unless the uterus is relaxed and danger of uterine rupture be absent. For this procedure the use of chloroform is indicated. If the child be dead when the physician sees the case, and the uterus be firmly contracted upon the fœtus, no hesitation must be felt in doing craniotomy. After opening and washing out the head delivery should be effected by the craniocast.

PLATE VIII.

FIG. 1.

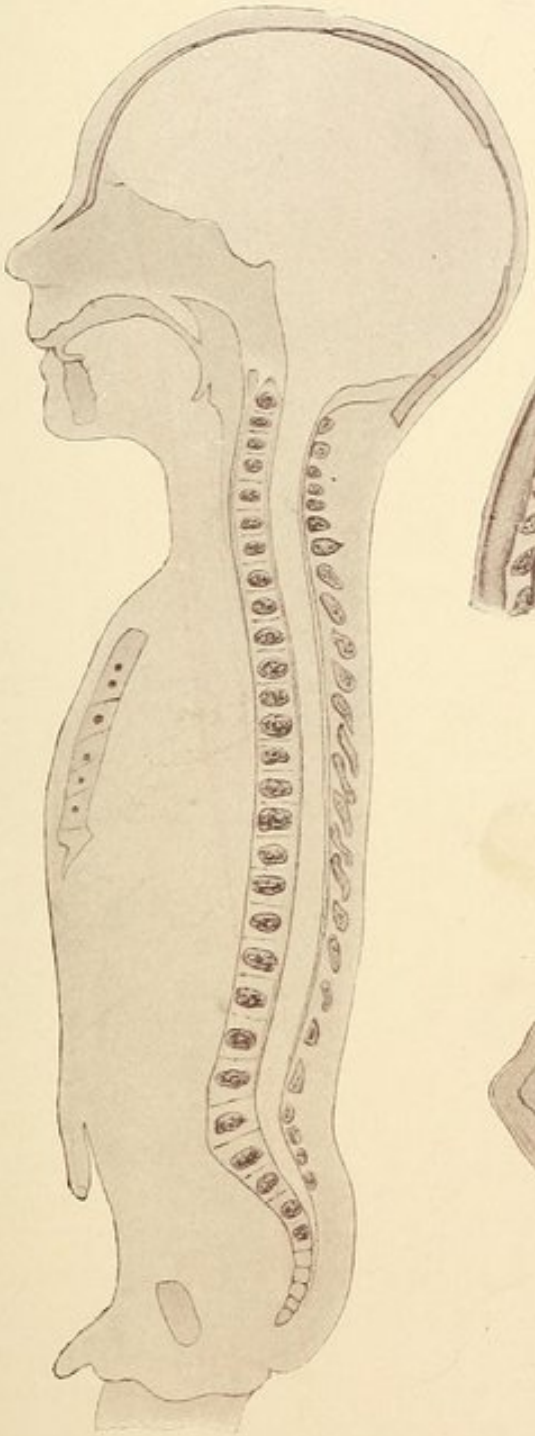


FIG. 2.

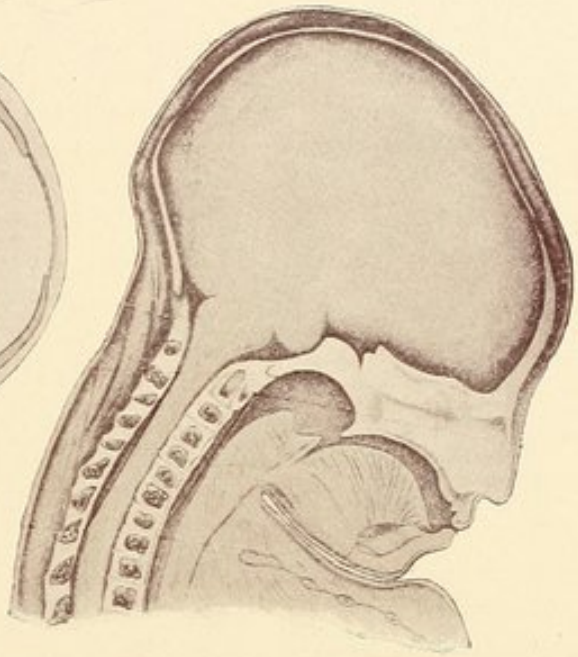
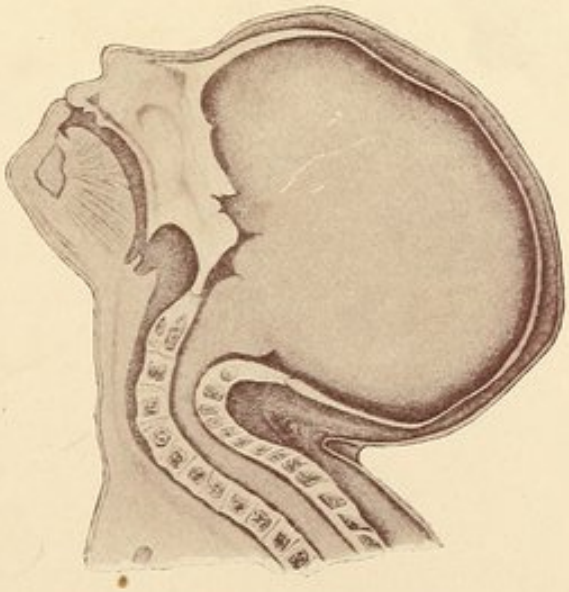


FIG. 3.



Head and Spinal Column of Fœtus, in Flexion and Extension. (KALTENBACH.)

In cases of contracted pelves, with parietal presentation of the fœtus, where pelvimetry, on examination, shows that labor is impossible in the normal way, if the child be living and strong, symphysiotomy or abdominal section should be performed.

Presentations of the parietal bones are of significance as indicating probable pelvic contraction or an abnormal condition of the child's skull. They call for a critical examination of the case and a wise choice of treatment. Probably the greatest error which can be made in these cases is the indiscriminate application of forceps and the effort to direct the head into the pelvis by forceps without further preparation.

It is very easy to err in a diagnosis of fœtal engagement in the pelvis in presentations of a parietal bone, or for the inexperienced in cases of normal labor. If the pelvic floor be such that vaginal examination is easy, the finger of the examiner comes readily upon the vault of the cranium, and the physician, because of this fact, may decide wrongly that the head has engaged. To avoid error it is necessary that the position of the skull of the fœtus with reference to the pubes be carefully ascertained. The head is not engaged until its most dependent point is at the level of the lower edge of the pubic joint. It is necessary, in studying the progress of labor, to note constantly the position of the vertex, or of the presenting part, with reference to the lower edge of the symphysis. In labor, in contracted pelvis, the presentation of the parietal bone often becomes exaggerated by lateral obliquity of the head, and this exaggeration or complete presentation of the parietal bone is mistaken for the gradual descent of the fœtus. This error can be readily avoided if the points stated are kept in mind in making a diagnosis. It is of great importance that a thorough examination be made in these cases, and, if the patient is nervous, restless, and resists examination from fear of pain, she should be wholly or partially anæsthetized and a thorough examination made. During this anæsthesia the physician may endeavor to fit the head of the fœtus into the pelvic brim by pressing downward upon the head behind the symphysis pubis. A few moments' trial will suffice to determine whether or not the head can engage.

In ascertaining this fact it must be remembered that certain postures of the patient are much more favorable than others to secure descent and engagement. What is termed Walcher's position of the patient has been shown to favor, more than any other, the possible engagement of the head. This is obtained by bringing the patient to the edge of a bed or table, her hips projecting considerably over the support upon which she lies. Her thighs are extended and allowed to fall downward, resting either upon the floor or on a couple of chairs. In this way the pelvis is tilted downward and backward, and it has been found by observation that the pubes is put upon the stretch, and that a slight rotation of the two halves of the pelvis, with corresponding enlargement in the pelvic brim, takes place. With the patient in this position it may be possible to press the head down to the level of the lower border of the symphysis, and thus to bring about a virtual engagement. An inexperienced observer will decide that engagement is present when he can readily touch the head, but as this depends upon

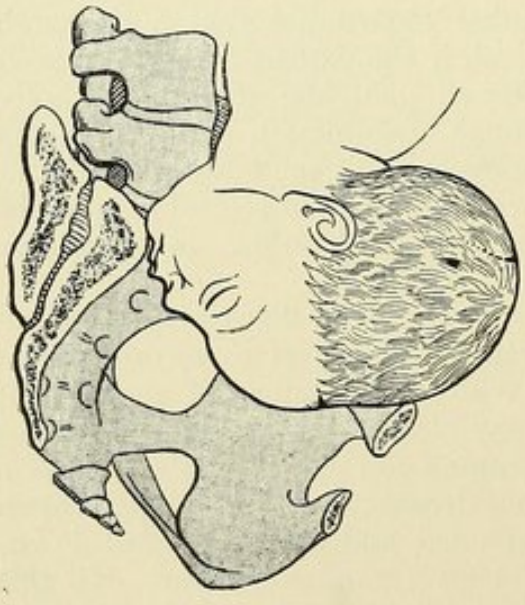
the length of the vagina, the rigidity of the pelvic floor, and often upon the posture of the patient, it will readily be seen that these are deceptive and misleading data upon which to base a judgment.

CHAPTER X.

FACE PRESENTATIONS AND THEIR MANAGEMENT.

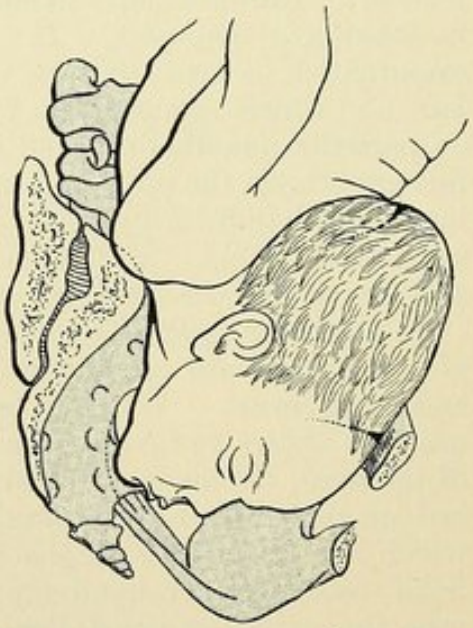
ALTHOUGH in the great majority of cases the occiput descends and presents in labor, in others the chin becomes lower than the occiput and forms the lowest portion of the head during labor. This is termed face presentation. In some cases this condition is but imperfectly developed, the chin descending but partially in the pelvis and the brow of the child lodging against the brim of the pelvis. This is termed brow presentation. In naming these presentations two methods are in use—one consists in taking the forehead of the child as a cardinal point and in naming positions in accordance with that part of the pelvis toward which the forehead is directed. Face presentations have but two positions. As for others, the most usual are those in which the

FIG. 89.



Brow presentation.
(FARABOEUF and VARNIER.)

FIG. 90.

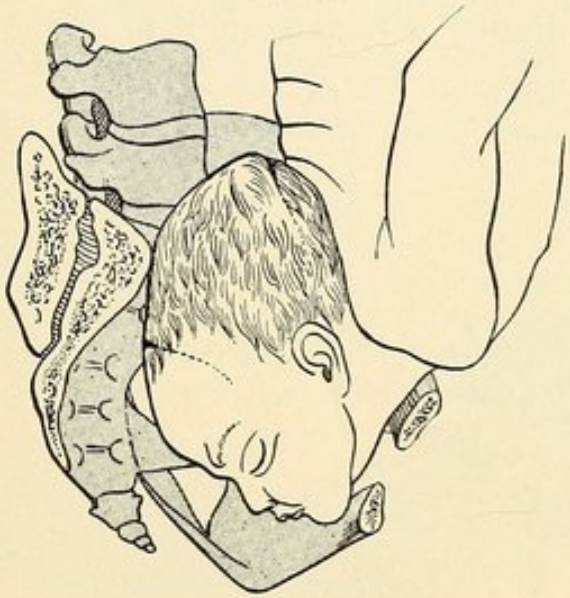


Face presentation. Descent of the fœtus.
(FARABOEUF and VARNIER.)

forehead is directed toward the mother's left side, the back of the child being also on the left. These are termed fronto-anterior and first positions in face presentations, the most common of these being left fronto-anterior. In these positions the chin is upon the right side of the pelvis and obliquely behind, at the right sacro-iliac joint.

Others prefer to take as a cardinal point the chin of the child, because it is lowest, and hence presents to the finger of the examiner, being the presenting part. Some would term the positions already

FIG. 91.

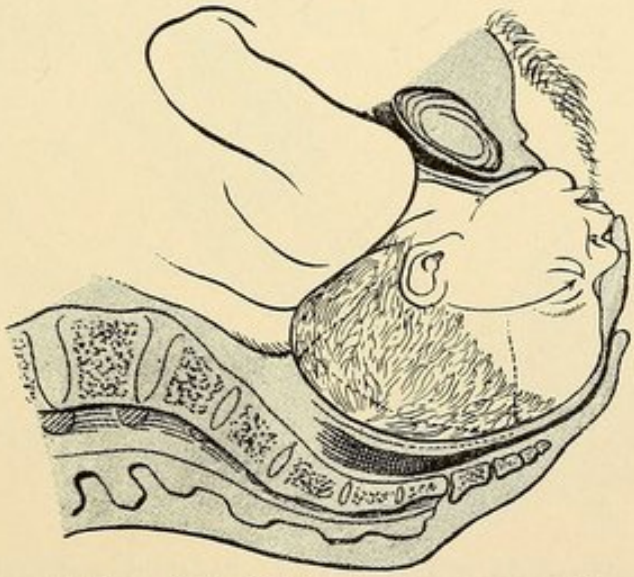


Face presentation. Anterior rotation of chin. (FARABOEUF and VARNIER.)

described as right mento-posterior. Brow presentations are but partially developed face presentations and have no separate nomenclature.

Labor occurs in face presentations by the development of strong extension. The occiput is forced upward against the back of the

FIG. 92.

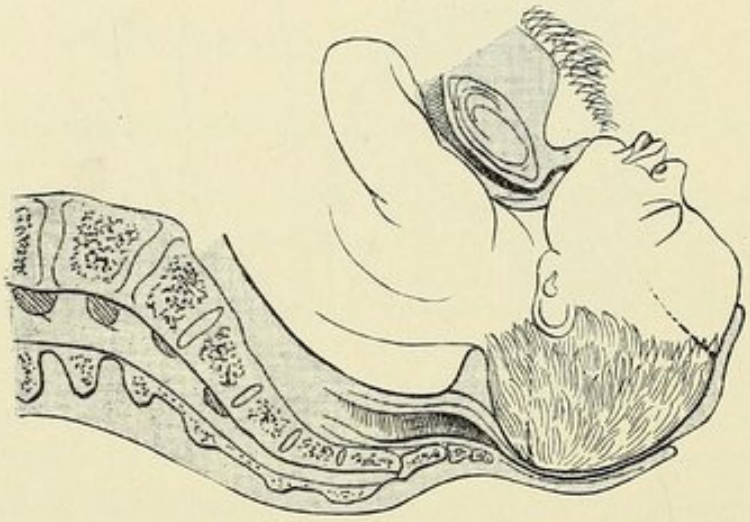


Face presentation. Birth of the head. (FARABOEUF and VARNIER.)

child's neck, while the chin projects lowest in the pelvis. The forehead is in front of the median line upon the left side. As the head descends the chin comes upon the pelvic floor, the forehead turns behind, and the chin rotates forward under the pubic joint. The chin

gradually protrudes beneath the pubic joint, while the head is born by strong flexion of the occiput over the pelvic floor. The birth of the shoulders is accomplished in the manner in which this occurs in normal labor. In second positions of face presentations birth occurs in the same manner, with the exception of the fact that the chin rotates from right to left, instead of from left to right.

FIG. 93.



Face presentation. The head on the pelvic floor. (FARABOEUF and VARNIER.)

In brow presentations labor is impossible, as a rule, until the position of the head is altered. Face presentations are found in cases where the head and pelvis are not proportionate in size, and where some peculiarity in the shape of the head favors extension rather than

FIG. 94.

Face presentation. Birth of the head. (FARABOEUF and VARNIER.)

flexion. This condition is diagnosticated by palpation, when the occiput will be found above the brim of the pelvis, instead of presenting as in normal cases. The back of the child is often not so near the mother's abdominal wall, and hence heart-sounds are not so plainly heard.

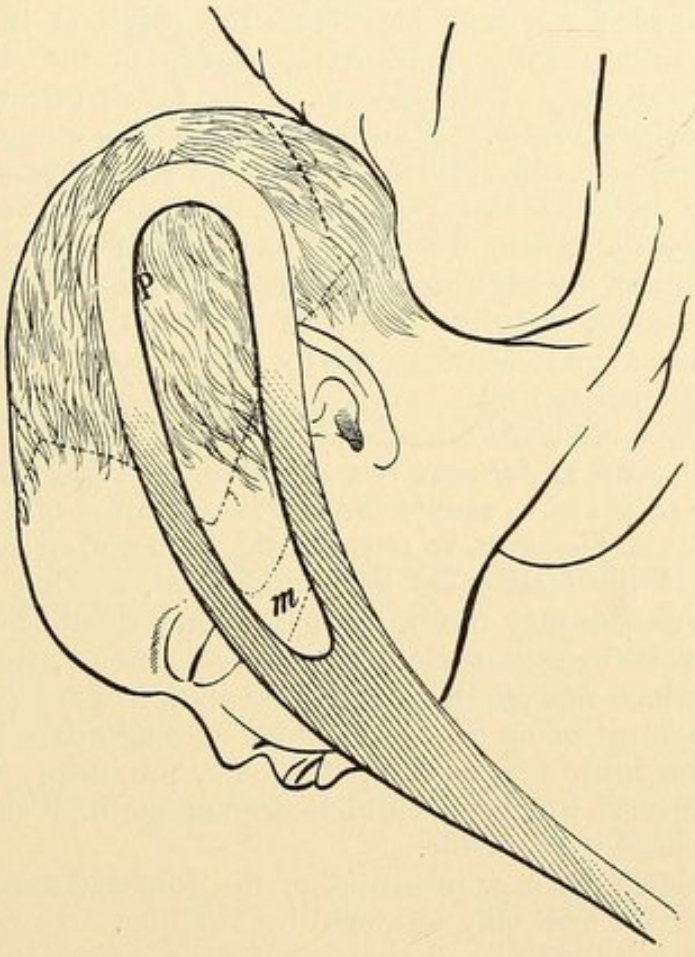
By internal examination the chin is detected and the face occupying the usual position of the sagittal suture. The forehead of the child may sometimes be felt, but often is not readily reached.

The management of these presentations consists in keeping the membranes unbroken as long as possible. If birth is to occur in face presentation, the chin must descend and turn in front. If the membranes rupture early, this descent is prevented and the head may become impacted in the pelvis. The patient should be urged not to strain violently and should be kept lying upon the side toward which the back of the child is pointed.

After the membranes break the physician's care should be to watch the rotation of the chin. As long as this continues to move toward the front, labor is progressing and should rarely be interfered with.

The mother's strength must be preserved and every effort made to prevent exhaustion. When, however, the head does not descend and the chin fails to turn to the front, one of several procedures may become necessary.

FIG. 95.



Forceps in face presentation. (FARABOEUF and VARNIER.)
P. Parietal eminences. *m*. Malar protuberances.

All of these require anæsthesia. A pair of narrow-bladed axis-traction forceps should be at hand and aseptic. Tarnier's forceps are well suited for use in these cases. The patient having been properly placed and the vagina douched with creolin, the bladder emptied by a

catheter, the physician introduces the hand which is opposite the chin of the child. He determines whether the head is impacted in the pelvis and whether manipulation can easily dislodge it. He may then endeavor to pull down the chin and bring it gradually to the front. If he can move it but partially, he may apply Tarnier's forceps to the sides of the head with axis-traction and bring the head upon the pelvic floor in this way. If the head is high in the pelvis, but movable, many advise the prompt performance of podalic version. In this chloroform is the better anæsthetic.

If the forceps are used, the blades must be carefully applied to the sides of the child's head and face and accurately fastened.

Traction should be made in the axis of the pelvis only; when the chin is beneath the pubes the occiput must be brought out by flexion over the pelvic floor. Rupture of the perineum will often occur and should be anticipated by episiotomy.

If the chin, instead of turning in front, rotates behind, beneath the promontory of the sacrum, labor ceases. A moment's consideration will show that, if uterine contractions persist, the head of the child and also the thickness of the chest must enter the pelvis at the same time if progress is to be made. The anterior surface of the chest is forced against the promontory of the sacrum. The fœtus becomes impacted and further progress ceases. If such a case has been going on for some hours when first seen, the child will have died from pressure.

Craniotomy in these cases is difficult, because the head must be entered through the face or forehead, which is often high in the pelvis. If the fœtus can be dislodged under chloroform, podalic version is indicated. If, however, the child is firmly held in the grasp of the exhausted uterus, it may be removed by embryotomy or more safely taken by abdominal section.

In cases where the birth-canal is not sufficiently large to permit the passage of the head at term in face presentation symphysiotomy may so enlarge the pelvis as to render the anterior rotation of the chin possible or enable the physician to push up the head and deliver the child by version. If the birth-canal be undeveloped, so that tears of the vagina and perineum may result, symphysiotomy should not be chosen.

If the fœtus becomes impacted in brow presentation, the same problem presents which was offered in the presentation of the parietal bone. The physician must bring down the chin, making a face presentation, or dislodge the brow and push up the chin, producing a vertex presentation. In cases where the child is dead craniotomy should be performed if the head is accessible.

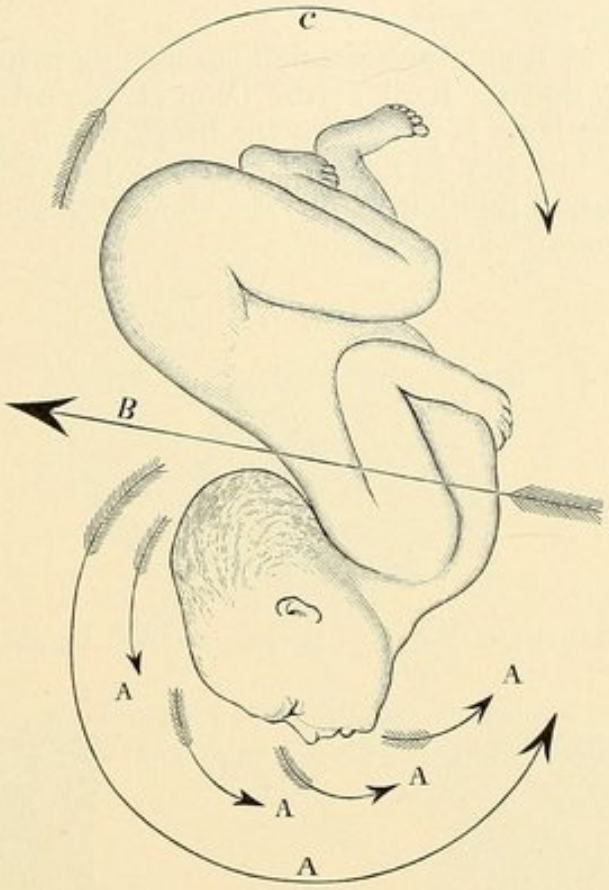
When delivered in brow presentation the forehead may be severely bruised, so that the eyes may be closed by swelling. In face presentation the child is in danger of choking if delay occurs in the delivery of the head and the throat is brought closely against the pubic joint. The mother suffers from longer, more painful, and tedious labor, while her chance of injury is great.

If craniotomy is not to be performed, various procedures have been proposed for changing face presentations, when impacted, into occipital.

By external manipulation it has been advised that the trunk of the

fœtus be firmly grasped through the abdominal wall and that the body be raised and the face dislodged. It will sometimes be possible,

FIG. 96.



Correction of face presentation by manipulation. Arrows show direction in which various parts of fœtus are carried by operator. (THORN.)

A. Toward the pubes. *B*. Toward the sacrum. *C*. Breech carried toward mother's anterior abdominal wall.

however, with the aid of deep anæsthesia, to accomplish the desired result by this means.

CHAPTER XI.

BREECH LABOR AND ITS MANAGEMENT.

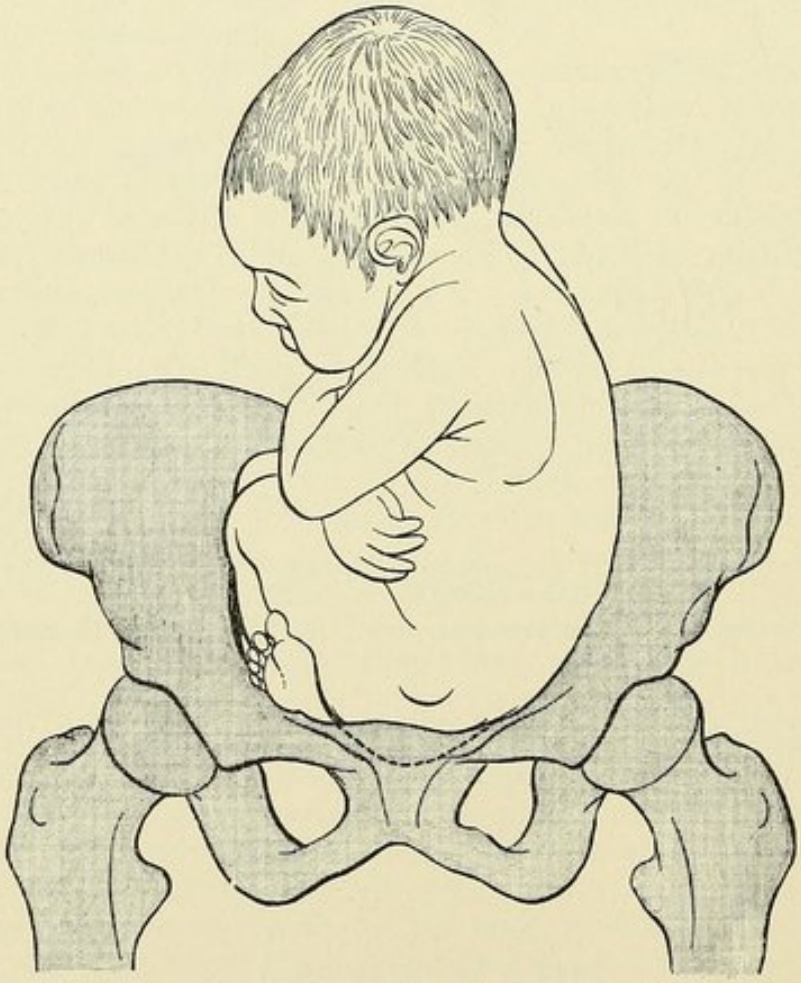
THE fœtus may present by either extremity, and spontaneous labor occur when the breech presents as well as when the head is born first. No exact cause is assigned for breech presentation, as it frequently occurs in patients with normal pelvis and when the child affords no abnormality.

Breech labor is divided into two positions—the first and second. In the first the back and sacrum of the child are directed toward the left

side of the mother's pelvis, while in the second position in breech presentation the back and sacrum are directed toward the right side of the mother's pelvis. In either case the head is found at term above the umbilicus, while the heart-sounds are heard as high as the umbilicus in many patients.

The diagnosis of breech presentation is made by palpation, when the physician fails to find the head at the brim of the pelvis. Instead, a smaller and softer body is present at the brim, which can often be carried more easily into the pelvis. The back of the child is found by palpation in its usual position, while the shoulders and head are discovered at the fundus of the uterus.

FIG. 97.



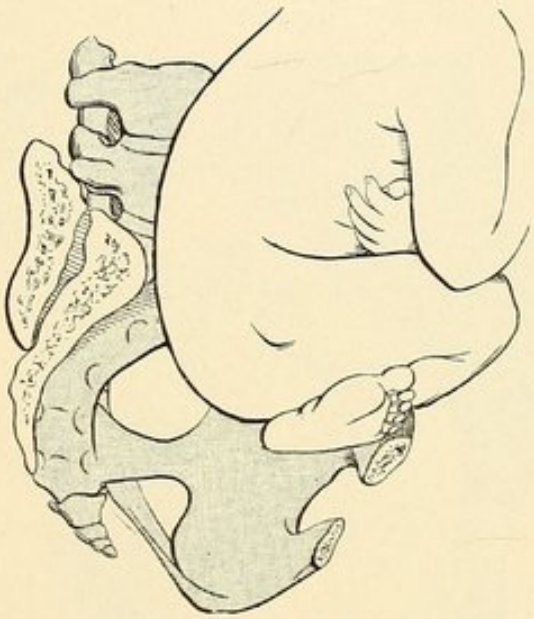
First position. Breech presentation. (FARABOEUF and VARNIER.)

On auscultation heart-sounds are heard near the level of the umbilicus, and in rare cases, in which the back of the child is behind, heart-sounds may be heard with remarkable distinctness.

If the abdomen be inspected, in women who are thin the abdominal tumor of pregnancy may be noticed to be larger near the umbilicus than when the head presents. If vaginal examination be made during the last weeks of pregnancy, the examiner will observe the absence of the child's head from the brim of the pelvis.

Although the breech may descend, as the head usually does, in the last two weeks of pregnancy, still the difference in shape and consistence

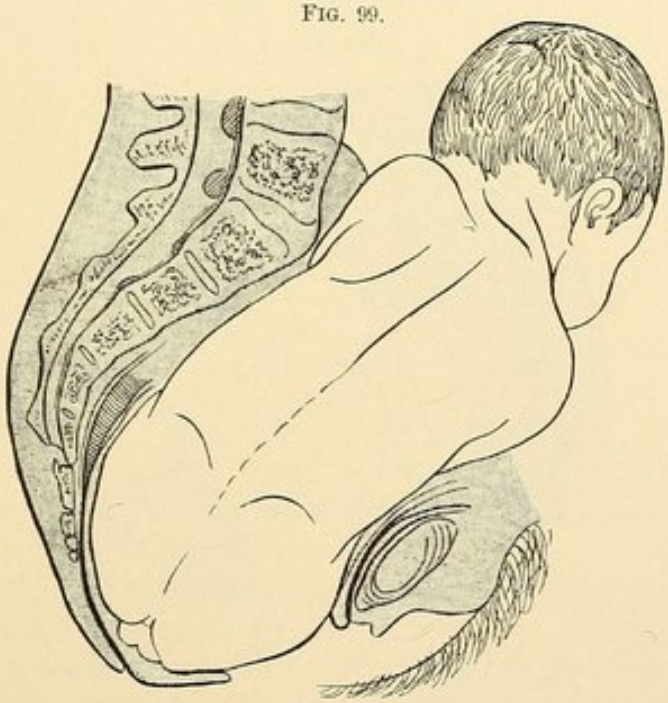
FIG. 98.



Back posterior. Breech presentation. (FARABOEUF and VARNIER.)

between the two, and the fact that the breech dilates the lower portion of the uterus much less than does the head, should assist in diagnosis.

FIG. 99.

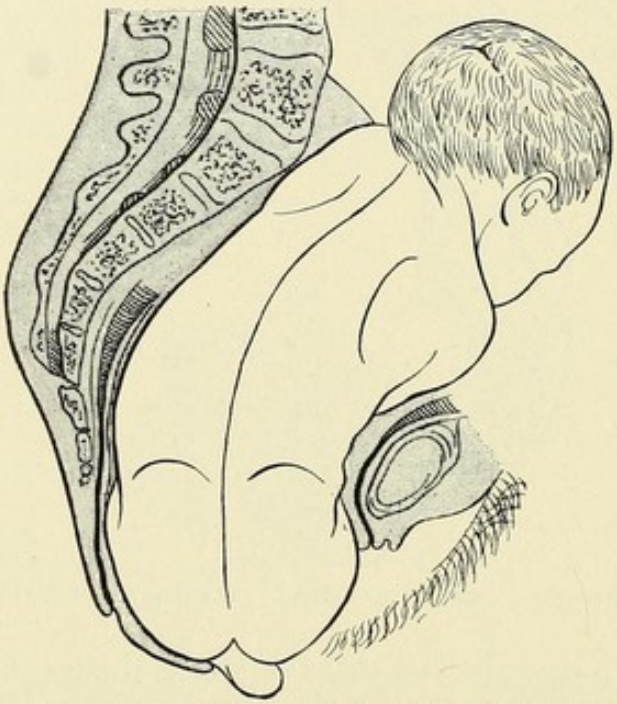


Second position. Breech presentation; descent of breech.
(FARABOEUF and VARNIER.)

The course of labor in breech presentations consists, first, in the descent of the breech and its passage through the pelvis. The posterior hip,

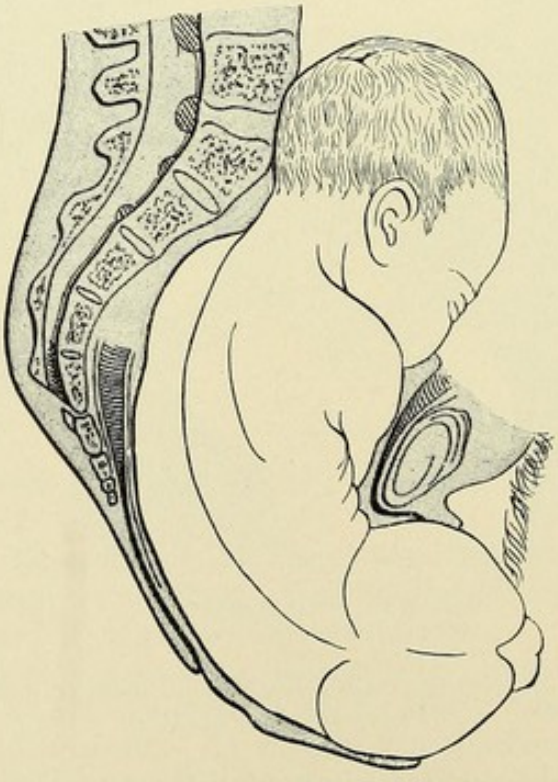
usually the right, comes first into the pelvic cavity, the body of the child descending with its bis-trochanteric diameter occupying the left oblique diameter of the pelvic brim.

FIG. 100.



Second position. Breech presentation; descent and expulsion of breech.
(FARABOEUF and VARNIER.)

FIG. 101.

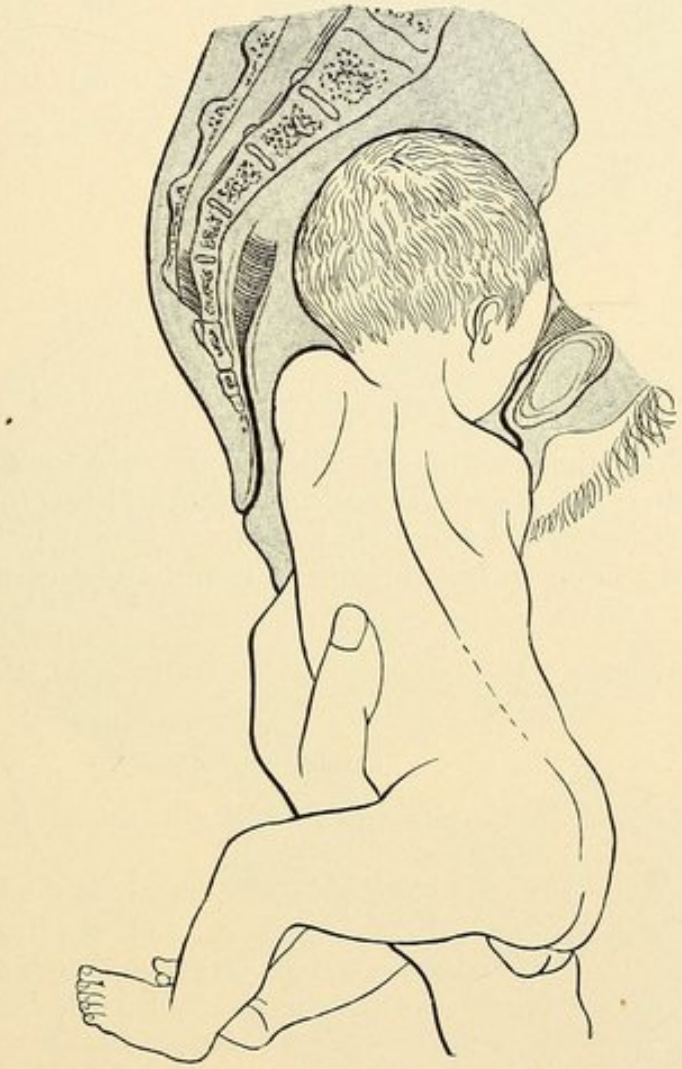


Second position. Breech presentation; descent and expulsion of breech.
(FARABOEUF and VARNIER.)

The body of the child is then bent upon itself by lateral flexion. The left hip of the child passes beneath the pubic joint and pivots there, while the right hip descends over the pelvic floor. When the hips emerge the rest of the body follows readily until the arms and shoulders are reached.

In normal cases the forearms are flexed upon the arms, while the arms are carried across or flexed in front of the chest. The head is also strongly flexed. As the body descends the left shoulder and arm

FIG. 102.

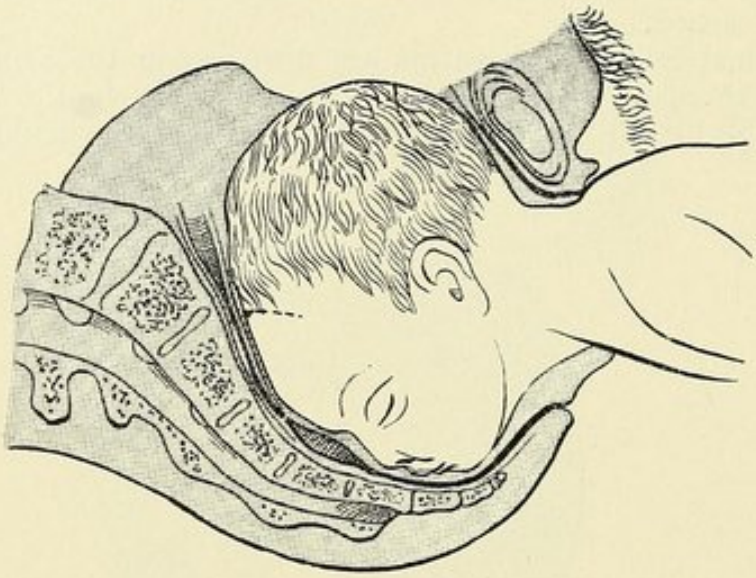


Breech presentation. Normal birth of shoulders. (FARABOEUF and VARNIER.)

pivot beneath the pubic joint, while the right shoulder and arm descend into the vagina and are expelled. The left then follow readily. The shoulders being born, the head has descended to the pelvic floor in the right oblique diameter of the pelvis, the occiput toward the left and the chin below and to the right. The face and chin descend upon the pelvic floor, and strong flexion should result. This is partially caused by the occiput, which is forced strongly against the pubic joint and meeting this obstacle causes flexion to become pronounced. The occiput pivots behind the pubic joint until, by strong flexion and expulsive

effort, the face has swept over the pelvic floor and perineum, when it emerges from the mother's body. The occiput readily follows.

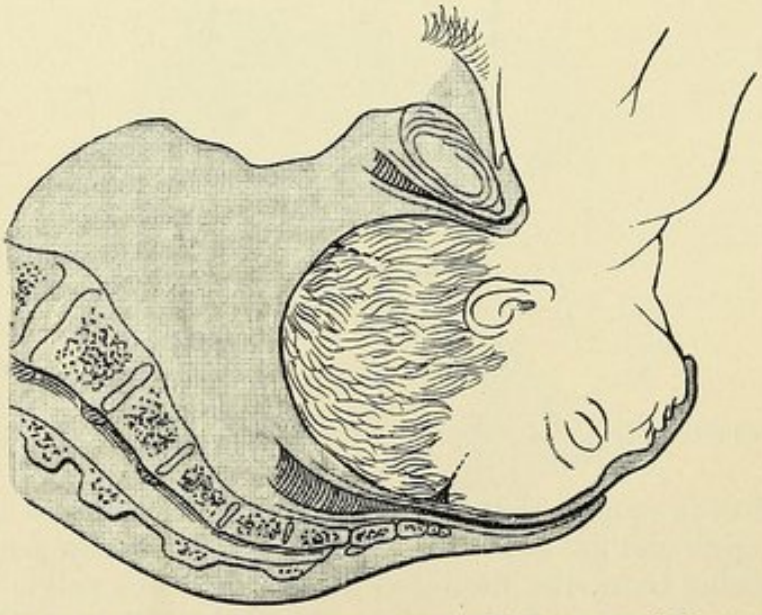
FIG. 103.



Normal engagement of head. Breech presentation. (FARABOEUF and VARNIER.)

In cases in which the back of the child is directed toward the right side of the mother the same mechanism obtains, although rotation is from right to left instead of from left to right. In order that the normal mechanism of labor in breech presentation may be carried out, the

FIG. 104.



Normal birth of head. Breech presentation. (FARABOEUF and VARNIER.)

fœtus must be in the position of universal flexion, and the delay and difficulty in labor which often arise in these cases are caused by some variation from this attitude.

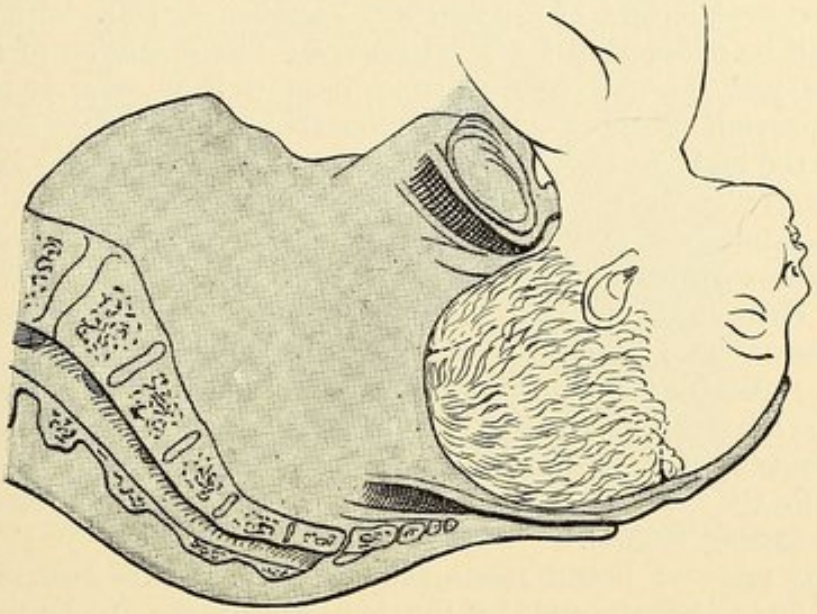
The prognosis of breech labor is good for the mother, as she need

sustain no severe injury unless she has a contracted pelvis. On the contrary, such labor is dangerous for the child, because the cord may easily be pressed upon, causing asphyxia, and the child's throat and head be subject to serious pressure at the moment of delivery.

The child may sustain fracture of the clavicles or of the arms during delivery.

The treatment of breech labor consists in carefully preserving the membranes unbroken. The breech dilates the uterus more slowly than the head, and hence the membranes are more needed in breech labor than in normal cases. The first stage of these labors is often prolonged, as the patient does not usually make strong expulsive effort and dilatation is slow. Every precaution should be taken to avoid exhaustion, and rest must be procured, if necessary, by anodynes.

FIG. 105.



Normal expulsion of head. Breech presentation. (FARABOEUF and VARNIER.)

When the expulsion of the fœtus begins, its descent will often be more tardy than that of the head, and uterine contractions are frequently not so strong as in normal labor. The physician, while keeping himself informed of the progress of labor, should interfere as little as possible with the descent of the breech through the pelvis.

If the uterine contractions are deficient, quinine may be given or alcoholic stimulants, while rubbing the uterus and pressing the fœtus down are often useful. The physician must realize that at the moment when the shoulders and head are passing through the pelvis care must be taken to avoid delay if the life of the child is to be preserved. It is well to state to the friends of the patient that labor is not a normal one, and that while the mother is not in especial danger, the life of the child will demand great care. Wherever it is possible, and especially in primigravidæ, the physician will do well to have an assistant at hand. In cases where expense is no object a second physician should be summoned, who will act as assistant to the obstetrician.

There should be in readiness forceps suitable for axis-traction, appliances for suturing the pelvic floor and perineum, and a small catheter for inflating the child's lungs, while a hot bath must be ready for the child, to assist in its resuscitation. Several hot towels should also be in readiness, with stimulants and hot and cold water. Although an anæsthetic is not always needed, it should be at hand, and chloroform will be found most useful.

When the hips of the child appear at the vulva the patient should be placed across the bed, her hips at the edge, her thighs flexed upon the abdomen, and her feet supported in two chairs or held by assistants. As the child emerges it is well to pass the fingers beneath the child's abdomen, to see whether a loop of cord has descended and is being pressed upon by the child. If this be the case, the loop should be brought with the fingers to that portion of the pelvis where there is greatest room. This is usually the curve of the pelvic brim at one side of the promontory of the sacrum. The choice as to which of these points will be chosen must depend upon the circumstances of the case.

As the body of the child emerges it is well to wrap it in a warm towel to prevent efforts at breathing from the stimulus of the external air.

When the body has been born to the shoulders the physician should bend the trunk of the child laterally, raising the hips toward the mother's abdomen and carrying the right shoulder of the child obliquely downward and forward. The right shoulder and arm will then be born into the vagina, while the left will pass beneath the pubic joint. Both elbows and shoulders often emerge from the vulva together. As the head comes upon the pelvic floor a slight delay occurs in labor. Pressure upon the perineum often sets up strong uterine contractions. The chin of the child sinks low upon the pelvic floor, while the head passes quickly over the perineum and through the vulva by strong flexion.

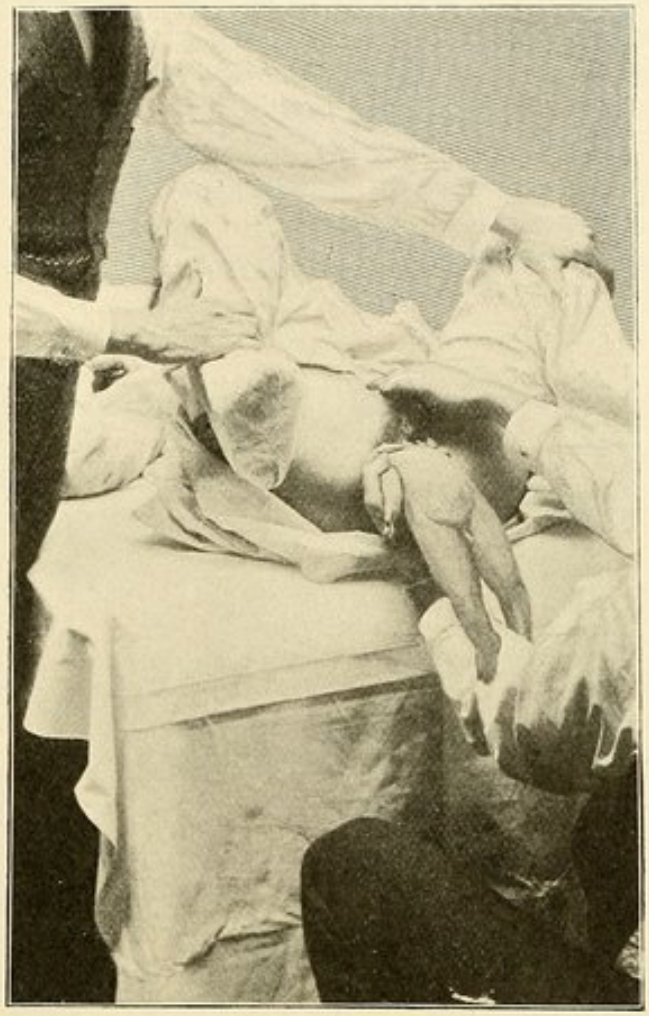
At this stage of breech labor the physician should grasp the child, wrapped in a warm towel, by the legs, and carry its body strongly upward over the mother's abdomen. With the other hand he should make strong pressure, laying his hand across the head just above the mother's pubic joint.

In normal breech labor the head readily emerges with this manipulation.

The perineum and pelvic floor are often lacerated in breech labor, because the head must emerge so rapidly that no time is given for dilatation ; but the laceration is seldom extreme unless undue force and haste are used in delivering the child.

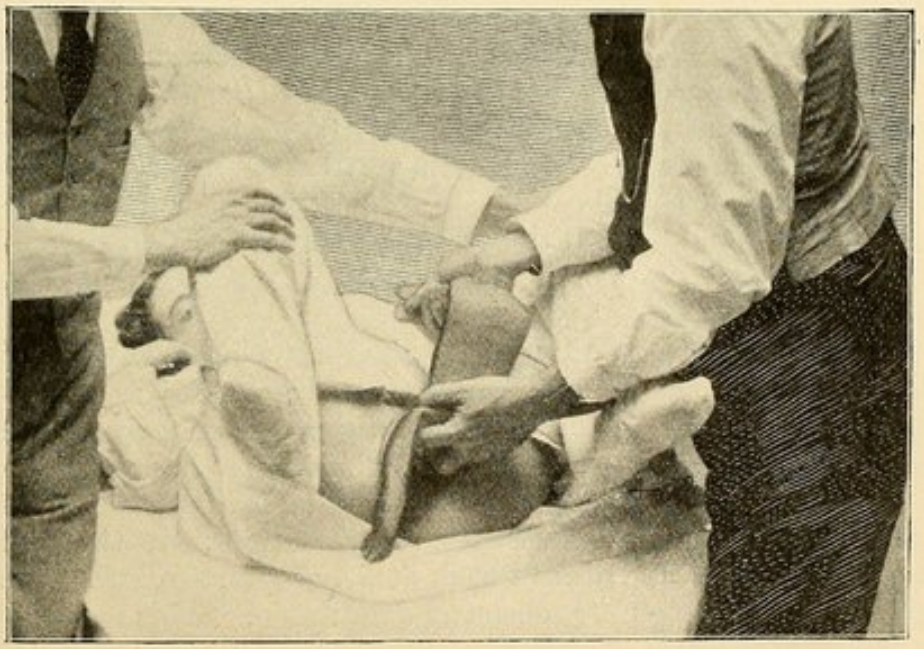
Where the back of the child is turned toward the spinal column of the mother, the face of the child looking toward her abdomen, delivery is effected in a different manner from that already described. The body of the child may be rotated into its normal position if the physician detects the abnormality promptly, and makes pressure obliquely upon the child's hips. If, however, the body is not rotated, care must be taken not to make traction upon the hips, as the child's chin, which is anterior, may be easily drawn away from the chest and the head extended. The arms and shoulders are born as in cases where the back is anterior.

FIG. 106.



Bringing the head upon the pelvic floor, normal breech labor.

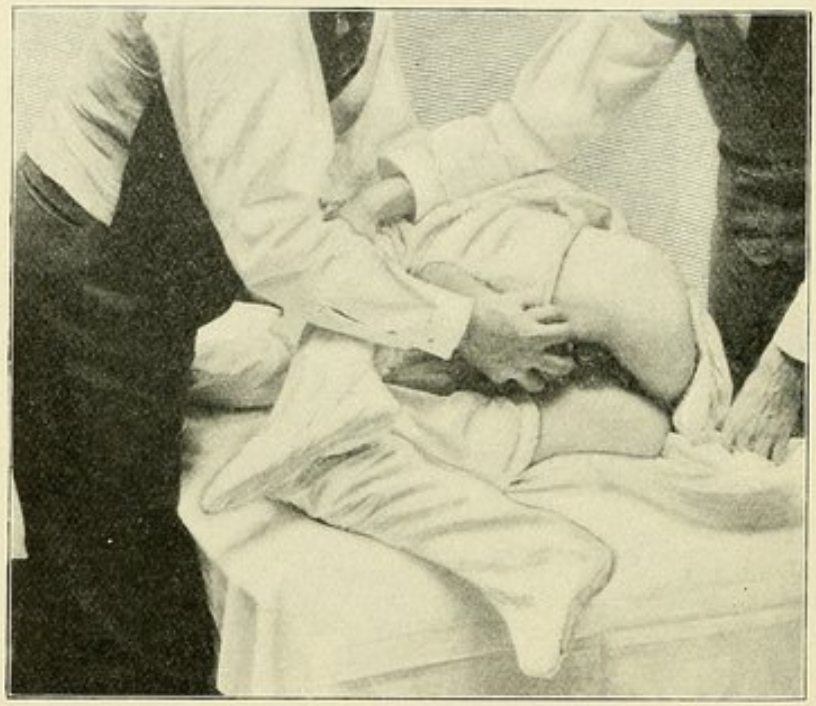
FIG. 107.



Raising the body at the expulsion of the head, normal breech labor.

Flexion must be maintained and the head brought to descend until the chin is in the vulva and the forehead is beneath the pubic joint. The head will then pivot upon the forehead and the occiput pass out over the pelvic floor by flexion. In these cases it is advantageous to turn the mother upon her side, separating her thighs widely. The body of the child should be carried backward as the arms emerge, pressure being made upon the chin to prevent extension. When the forehead has reached the pubic joint the body may be carried strongly upward and forward, thus bringing the occiput over the pelvic floor.

FIG. 108.



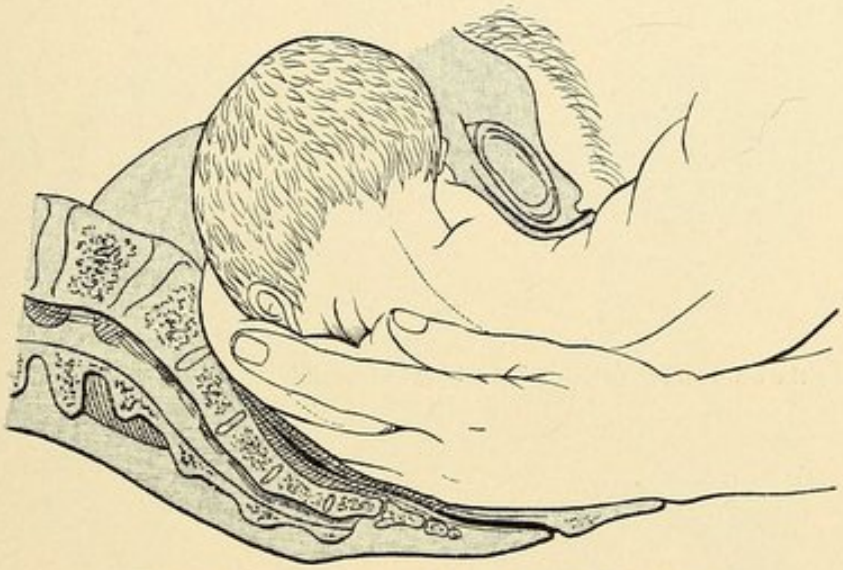
Delivery in breech presentation; the fœtal back posterior.

Breech labor may be complicated by extension of the arms above the head and by extension of the head upon the trunk. Both of these complications arise from traction upon the trunk or from strong expulsive efforts on the part of the mother after the breech and legs have been born. These complications are dangerous to the child, because they delay labor and subject the child to pressure, and also because the treatment of these complications exposes the fœtal limbs to danger of fracture.

Two procedures are especially available in avoiding complications in breech labor. One is to make as little traction as possible upon the trunk, while the other consists in making pressure upon the uterus in following the child down from above during its birth. When the body has been born and the arms and elbows cannot be felt, the arms must be brought down by the following manipulation: If the mother is excessively sensitive and draws back at every effort to assist her, chloroform should be given to obstetric anæsthesia. This can be readily done and will greatly assist the operator. The posterior shoulder

and arm should be first brought down by gentle traction upon the hips. If this be the right, the feet and legs of the child should be grasped, wrapped in a towel, by the operator's left hand and traction made downward, the body of the child then being strongly raised obliquely toward the operator's left hand and the mother's right. The right hand of the operator should be laid upon the back of the child, with its palmar surface downward. Two or three fingers should be passed up upon the shoulder and upon the arm of the fœtus. Care should be taken to carry the fingers to the fœtal elbow, for, if this is not done, pressure upon the middle of the humerus may cause fracture. The arm should then be carried across the child's body and obliquely downward. The right hand of the operator should then grasp the feet and legs, and carry the child downward and obliquely backward to the opposite side. The fingers of the left hand should then be passed along the back and upon the arm to the elbow, thus bringing down the anterior or left arm.

FIG. 109.



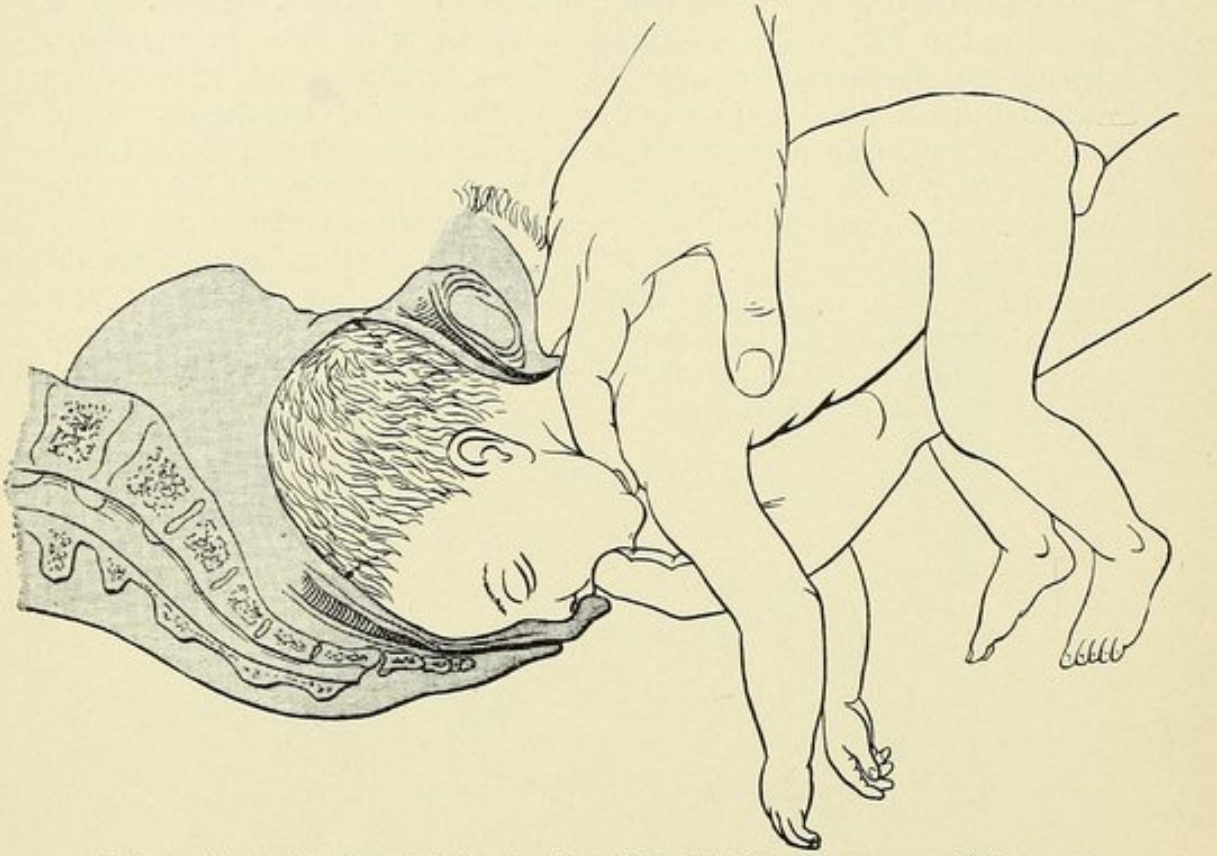
Bringing down an arm. (FARABOEUF and VARNIER.)

When the arms have been brought down, if delay occurs in the birth of the head, the left arm and hand of the operator, being thoroughly aseptic, should support the child, which is astride the forearm, while the longest finger of the left hand is inserted into the child's mouth. The index and third fingers of the hand, the palmar surface being toward the child's chest, should be flexed upon the shoulders. The right hand of the operator should be laid transversely behind the mother's pubic joint. The left arm and hand should raise the body of the child and pull downward upon the lower jaw. At the same time the right hand should press strongly downward and backward in the axis of the pelvic cavity.

When the head cannot be delivered by this manipulation the forceps should be inserted and applied to the sides of the child's head and axis-traction should be made. As soon as flexion of the head occurs upon the pelvic floor the handles of the forceps must be strongly raised

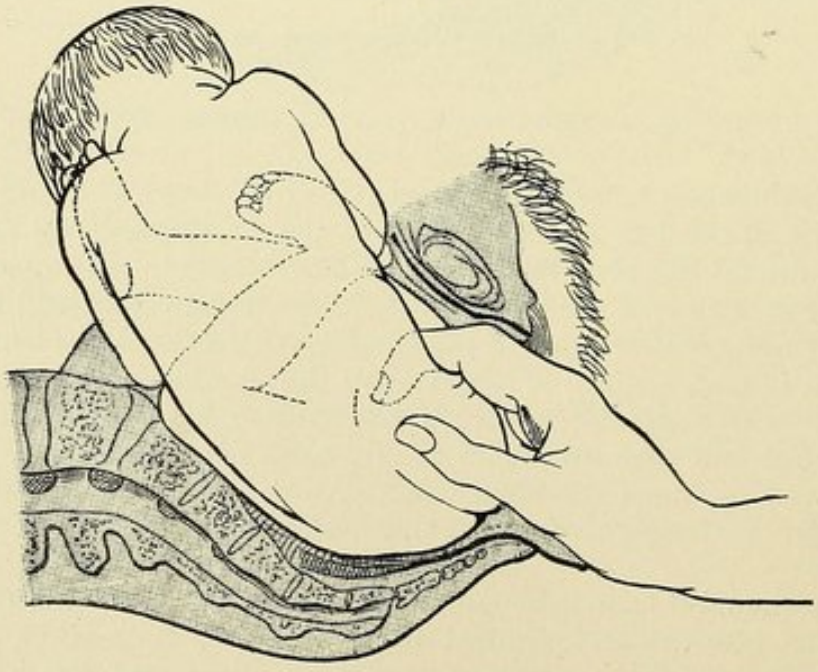
to bring the occiput out over the perineum. If the head cannot be delivered by these means, it is probable that the pelvis is contracted or that the head is of unusual size; and in view of the fact that the life of the

FIG. 110.



Bringing the head on the pelvic floor in delayed breech birth. (FARABOEUF and VARNIER.)

FIG. 111



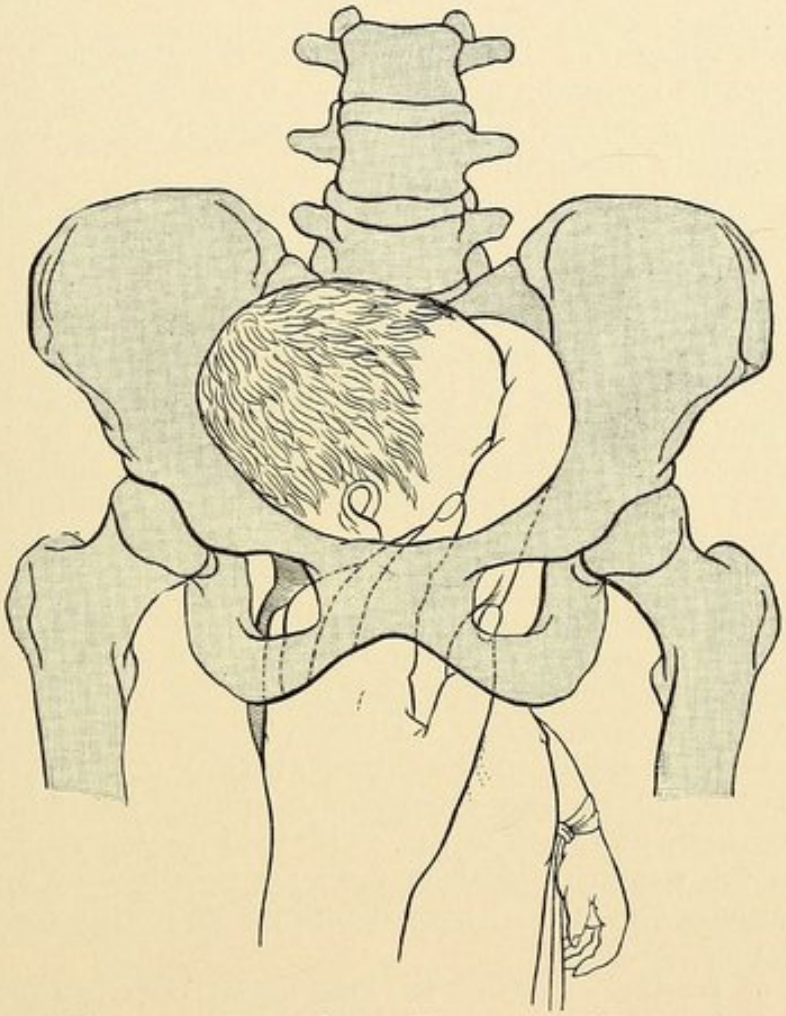
Traction in the groin; delayed breech labor. (FARABOEUF and VARNIER.)

child can endure not longer than five or ten minutes after the birth of the body and the retention of the head, if these measures are unsuccessful, the mother will be best protected by craniotomy.

Many methods of delivery of the after-coming head are described, but those mentioned have borne the test of experience and are successful in the great majority of cases.

It occasionally happens in the course of breech labor that complications arise by reason of an arm or leg which may be bent backward across the body or in front across the face of the child. When delay occurs in labor from these causes, if the legs and thighs be flexed upon the body of the child, the breech can usually be brought down by hooking a finger into the groin and making traction with the pains.

FIG. 112.



Dislodging an impacted arm. (FARABOEUF and VARNIER.)

If undue force is avoided, no greater harm can come to the child than chafing of the skin, which soon heals. In cases where the arm is drawn upward and across the face, and where strong uterine contractions may have forced the child into the pelvis, anæsthesia by chloroform should be carried sufficiently deeply to relax the uterus and enable the operator to carry the hand up and dislodge the arm.

In cases where the legs are flexed upon the thighs and the trunk of

the fœtus is forced into the pelvic brim like a wedge, the child must be dislodged by carrying the hand up and bringing down a leg and foot.

Footling cases are those in which the feet and legs are born in advance of the breech. They do not necessarily occasion complications, although dilatation of the uterus may be slow because of the small size of the presenting part.

There can be no question that a child can be more rapidly extracted in breech presentation through a normal pelvis than in other presentations. The advantages of such delivery are that the only instrument employed is the hand, which is most successful of all. The fœtus emerges in such a manner that its smaller portion comes first, thus gradually dilating the birth-canal, while the head passes through the pelvis in a short time and usually under the direct control of the operator.

The disadvantages of breech labor are the dangers to which it exposes the child by reason of pressure. Fractures of fœtal legs and arms occurring in breech labor do not seriously affect the fœtus, as union is commonly obtained.

If haste is imperative, it is better to deliver a living fœtus with a broken arm than to fail in bringing down the arms and lose the life of the child.

Should fracture of the arm or leg occur in hasty delivery, it will generally be found upon examination that such fracture is not complete, but that the ends of the bone are not forced through the periosteum, and that the fracture remains what is known as an incomplete or green-stick fracture. The treatment of these cases consists in accurately fitting to the part a light retention-splint and holding it in place by a light and elastic bandage. Brown pasteboard of moderate thickness or spongiopiline forms an excellent material for this purpose. Either may be readily cut to fit the part, dipped in hot water and softened, and then applied and bandaged with a cheesecloth or light flannel bandage. Sufficient cotton-padding should be used to make the splint thoroughly comfortable. To prevent excessive motion it is often best to fit a splint to the entire extremity of which the broken bone is a part. The bandage should not be applied too tightly; and if care be exercised, no injury to the child need be done. The results obtained in the treatment of these cases are usually very satisfactory. Union is usually obtained without deformity and with the preservation of functions.

In place of fracture of one of the long bones there may be present a separation of the epiphyses or even of the condyles. Such an injury is to be diagnosticated by careful palpation, by measuring and comparing the limbs, and by observing the impairment of function which often comes when the child attempts to move the joint nearest the site of the injury. The treatment of the condition is essentially that of fracture, care being taken to immobilize the joint near the seat of injury.

CHAPTER XII.

LABOR RESULTING IN THE IMPACTION OF THE FŒTUS (IMPOSSIBLE LABOR).

THE fœtus may become so turned in the normal pelvis as to become impacted and spontaneous delivery impossible. One of the most common forms of this abnormality is the transverse position of the fœtus termed shoulder presentations or cross-birth. A cause of shoulder presentations is a relaxed condition of the uterus and abdominal walls, which allows the uterus to fall forward and furthers the turning of the child across the pelvis.

The contraction of the pelvic brim is also a cause of transverse position of the fœtus, because the head of the child, not being able to descend readily, lodges upon one side of the pelvis, while intermittent uterine contractions tend to keep it there and gradually to bring down the trunk. Strong lateral flexion of the trunk may occasionally result in converting the presentation into a breech, gradually bringing the breech and legs into the pelvic cavity. In most cases, however, the shoulder is carried forcibly downward and becomes firmly wedged into the pelvic brim. The arm may be prolapsed into the vagina or may be folded upon the body of the child in such a manner that it serves to increase the bulk of the tissues which block up the entrance to the pelvis.

Many of these cases occur in patients in whom the child was at first in normal position. Instead of descending into the pelvis, the head lodged in the left iliac fossa, while the first uterine contractions compressed the trunk of the child, bent upon itself, and the head lodged at the brim of the pelvis, the right shoulder descended, and the right arm was gradually forced down into the vagina. It is a very rare occurrence for spontaneous delivery to occur in such a case. Occasionally, if the fœtus is small or the mother's pelvis large, the child may be folded upon itself and forced downward into the pelvis. If the fœtus passes the brim of the pelvis, the head will descend and may be delivered in the usual manner. This, however, happens so seldom that the case must be looked upon as one of impossible labor with a child of average size.

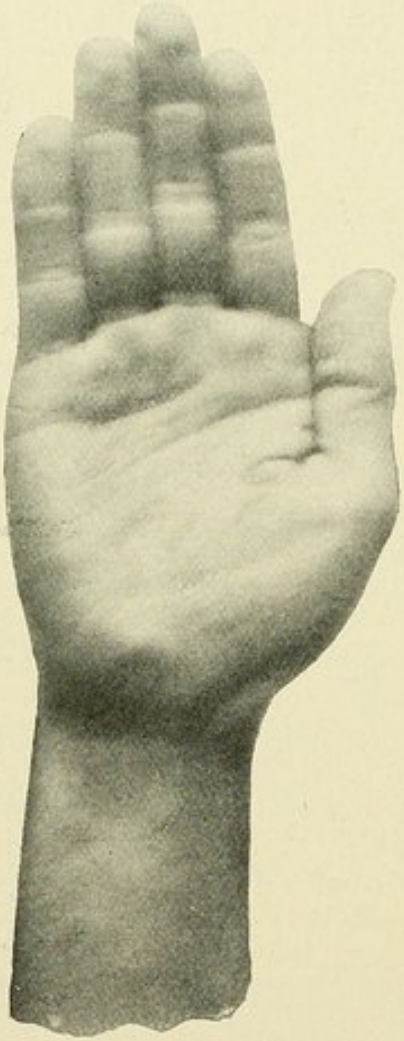
The left shoulder may present, the back being in front and the head of the child upon the mother's right side. It sometimes happens that the back is turned posteriorly, the abdomen of the child being toward the front and the face of the child being anterior.

The treatment of these conditions consists in the performance of version.

If the uterus is in a condition of tetanic contraction, the child being dead, decapitation should be performed in place of version. To turn

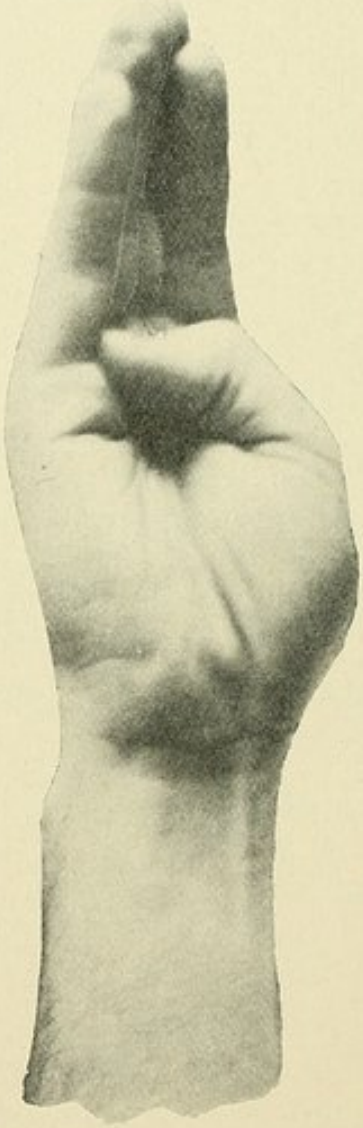
the child in these cases the operator should thoroughly examine the patient and map out clearly the position of the fœtus. This may be done largely by palpation, and the hand and arm which present may be recognized by turning the hand with the thumb upward and grasping it in the hand of the operator, as if to perform the act of greeting known as "shaking hands." If the hand of the operator fits the hand of the fœtus in the manner described, the fœtal hand corresponds to that of the operator. Thus, if the operator can grasp the hand of the

FIG. 113.



The hand unfolded.

FIG. 114.



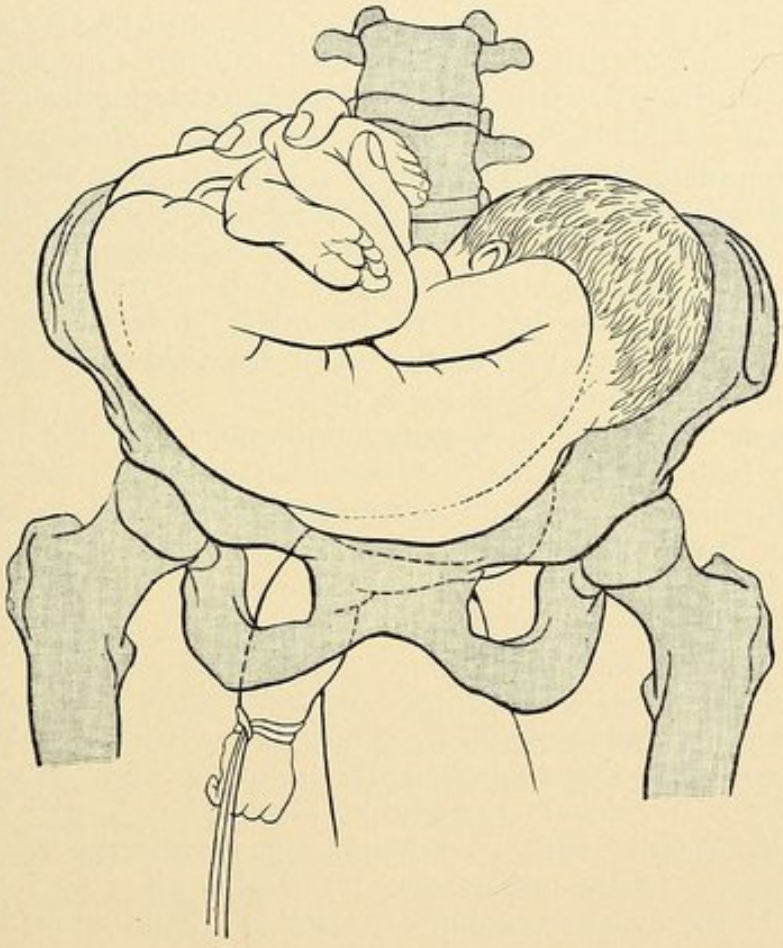
Folding the hand for version.

fœtus in this manner with his right hand, it is the right hand of the child which presents. If, on the contrary, it is the left hand of the operator which fits the fœtal hand, the presenting hand of the fœtus is the left. By following up the arm upon internal examination the fingers of the operator will come into the axilla and distinguish the ribs. When an accurate diagnosis of the child's position has been made the patient should be anæsthetized, preferably with chloroform, and placed

across a bed with her hips projecting slightly over the edge. The vagina should be thoroughly douched with creolin, 2 per cent. The hands and arms of the operator must be thoroughly scrubbed with soap and water, rinsed, and scrubbed with bichloride solution, 1 : 2000.

The usual instruments and appliances for normal labor should be at hand and also the forceps. The operator should select for introduction the hand which is opposite the feet of the child. Thus, if the right shoulder presents and the back is in front, the feet are upon the mother's right side and behind. As the physician sits opposite his patient his left hand is opposite the feet of the child. The fingers should be folded into a cone, the hand turned with its crossed diameter antero-posteriorly in the vulva, and the hand carried into the birth-canal by gentle pressure backward and downward. If the operator carries in mind the anatomy of the pelvis and the position of the child, his hand will readily come to the feet. The question, "Which foot should be grasped?" has occasioned much discussion. If both can be secured, this should be done; if only one can be taken, the lower foot, the right, is to be chosen.

FIG. 115.



Grasping the feet. (FARABOEUF and VARNIER.)

In grasping the foot it should be taken between the fingers, the fingers being flexed so that the nails are turned away from the wall of the uterus, while the thumb has been crossed beneath the fingers. Traction should be made gently downward and backward, while the other

hand of the operator carries the head of the child upward and backward by external pressure. The legs and breech should be brought upon the pelvic floor by gentle traction. When the feet and breech have been born the remainder of the birth is that of breech labor.

In rare cases the fœtus may be so folded upon itself and the uterus may have contracted so tightly upon the child that the child has perished, and further progress in labor is impossible. In these cases cautious efforts should be made, under complete anæsthesia by chloroform, to unlock the fœtus and complete the labor. With patients under complete anæsthesia it is seldom impossible to terminate successfully these cases. When, however, the danger of uterine rupture exists the physician is forced to one of two procedures—either to extract the child piecemeal or to perform abdominal section. If the former be chosen, the safest and best instrument to be employed is a pair of long, blunt-pointed, strong scissors. Guarded by the fingers of the operator, the fœtal bones may be severed with comparative safety. Long-bladed forceps are useful in extracting the different portions of the child.

Decapitation may be desirable in these cases, thereby avoiding the manipulation necessary to extract the child piecemeal. Many instruments have been devised for this purpose, but most of them are open to the objection that they are complicated, difficult to clean, and possessed of a cutting-edge which may do harm to the mother. The best of these is the simple decapitation-hook of Braun, which consists of a probe-pointed hook terminating in a long handle. The hook makes an acute angle with the handle, and the whole is made of strong, well-tempered metal, and the handle or shank of the instrument terminates in a cross-bar at its distal extremity. It is introduced under the guidance of the opposite hand, and the hook is drawn as tightly as possible about the neck and then rotated from side to side, when it gradually severs the head from the body.

Other instruments for decapitation attempt to encircle the child's neck with a loop of fine chain. Others have been devised to carry a saw with cutting-edge or a fine cutting-wire concealed in the instrument which would readily sever the soft parts. All complicated instruments for decapitation are worse than useless, because their working is readily interrupted, and they sometimes do great injury to the mother.

Should decapitation be required, the mother should be completely anæsthetized, the bladder emptied, and the patient brought to the edge of a bed or table. The vagina should be made thoroughly antiseptic and the physician's hands thoroughly scrubbed. A pair of strong, blunt-pointed scissors with long handles is usually the best and simplest instrument. Some prefer scissors turned at an angle for the same purpose. If the arm has prolapsed, traction should be made upon it, aided by suprapubic pressure, until the shoulder has been brought as low as possible. Introducing two or more fingers of one hand, the neck of the fœtus is sought, and the scissors are slid along the examining-fingers and the neck gradually severed.

In cases where excessive development of the fœtal shoulders is present it is sometimes necessary to cut the clavicles. This can be done

with the same scissors, the point being chosen at the junction of the inner third with the outer two-thirds. The effect of thus severing the clavicles is to cause the shoulders to rotate inward and forward, thus very considerably lessening the size of the trunk and making that portion of the body susceptible to considerable compression in its passage through the pelvis.

It occasionally happens that twins may become so locked as to render delivery impossible. In these cases, if one child is partially born in breech presentation, it should be decapitated, the body removed, and the head pushed up into the pelvis. The second child may then be extracted by version or forceps. The loose head may be brought to the brim of the pelvis and then delivered with forceps.

Monstrosities may become impacted in the pelvis and labor be impossible. Such cases are to be treated by embryotomy, as the life of a monstrosity is never to be considered.

Labor may also be prevented by impaction in the pelvis of a tumor with the fœtus. Thus, a fibroid tumor of the uterus may become wedged with the fœtal body. An ovarian tumor may prolapse and become wedged into the pelvis with the uterus. In these cases abdominal section is to be chosen in the majority. If circumstances do not permit of this, an ovarian cyst may be punctured through the vagina or rectum and its size sufficiently lessened to permit the delivery of the child.

In cases of uterine tumors which render birth through the vagina impossible the child should be delivered by abdominal incision, followed by hysterectomy.

CHAPTER XIII.

MULTIPLE PREGNANCY.

By the term multiple pregnancy is meant the presence in the body of the mother of more than one embryo or fœtus. Usually both are contained within the uterus, although a number of cases are on record in which one fœtus has been within the uterus and the other has been an ectopic pregnancy, outside the womb.

The usual number of embryos in multiple pregnancy is two, but occasionally three, four, and five have been observed. Authentic cases in which six embryos have been found are very rare.

Multiple pregnancy may occur in one of two ways—either by simultaneous impregnation of more than one ovum or by successive impregnations at short intervals. The first is sometimes termed super-fecundation, while the second is styled super-fœtation. It is evident that until the envelopes of the ovum have closed the uterine cavity there is no reason why a second impregnation could not occur. Investigation

tends to show, however, that super-fecundation is much more common than is super-fœtation.

Heredity bears important influence upon multiple pregnancies. It is a familiar fact that in some families multiple pregnancy is observed in successive generations. Aside from this there is no known cause which predisposes to this condition except the general considerations of plenty or want, of destitution or abundance. It is observed that in countries where famine occurs that multiple pregnancies are rare.

The symptoms and signs of multiple pregnancies are an unusual distention of the abdomen, which becomes more and more evident as gestation continues. The shape of the abdominal tumor is not the pyramidal form of usual gestation, but is larger from side to side than in normal cases. Where the children are large and the amniotic liquid is deficient the outline of the abdominal tumor is often irregular by reason of the protrusion of the fœtal parts. The mother will often complain of an unusual sense of heaviness and impaired breathing by reason of her great size. If she has previously had children, she may be able to detect a greater number of fœtal limbs, and that movements are present over differing areas in the uterus.

The diagnosis of multiple pregnancy is often impossible before labor is well advanced or even partially completed. If palpation be practised, it is safe to assert that more than one fœtus is within the womb when two heads and one breech, or two breeches and one head, can be distinctly outlined by palpation: this diagnosis is made positive by hearing two distinct fœtal heart-sounds. Unless, however, palpation and auscultation give positive evidence in the manner just described, a certain diagnosis of multiple pregnancy is impossible. The vaginal examination aids but little in making a diagnosis of this condition before labor is well advanced. When dilatation is completed and a second child can be felt within the uterus the diagnosis is assured.

Very often no evidence can be found of the presence of the second child until the birth of the first has been accomplished.

The most common form of multiple pregnancy is that of twins. In these cases the sex may be the same, the children having but one placenta, one chorion, and two amniotic sacs. In other cases the sex is unlike; each child has its own placenta, its separate amnion and chorion. Twins are rarely of equal size and weight; and if two placentas are present, one will be found heavier than the other in proportion to the heavier child.

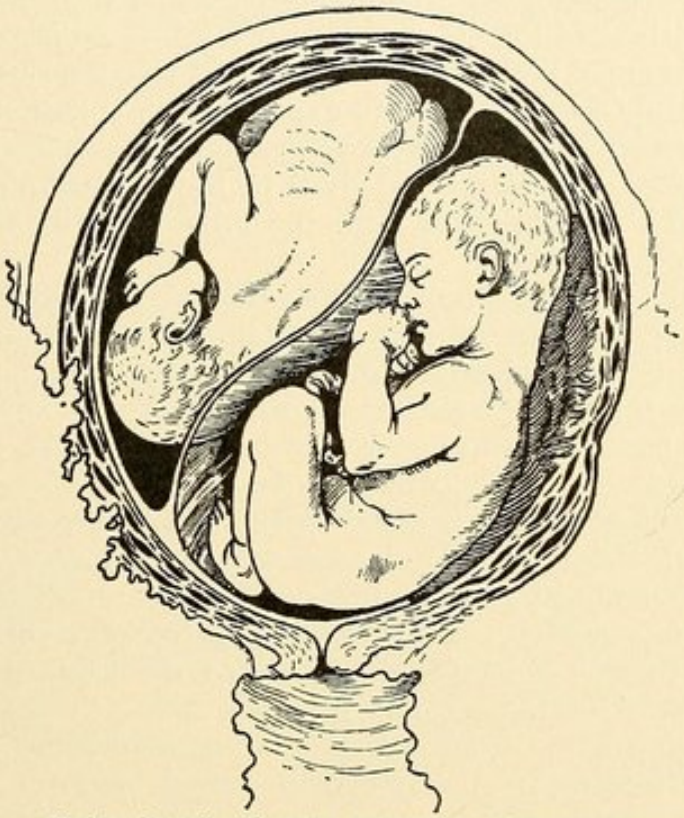
Labor in twin-pregnancy often occurs before the end of the full period of gestation. The overdistention of the uterus present in these cases renders uterine contractions easily excited, while the additional weight and increase of fœtal movements often bring about premature labor. In cases where an excess of amniotic liquid is present gestation rarely goes to its full term.

Twins usually present in differing presentations—one with the head and the other with the breech. In these cases the head, being the larger part, will usually force aside the breech and descend first into the pelvis. In other cases both children may present by the head or breech.

Labor in twin-pregnancy is usually free from complications often seen in some cases, while other abnormalities may be present. As

each child is usually slightly smaller than the average, there is but little difficulty in the passage of the children through the pelvis and genital canal, unless the twins become locked. In cases in which birth is spontaneous there is usually little or no laceration of the perineum and pelvic floor. If, however, the bodies of both children are forced into the pelvis at the same time, impaction may occur.

FIG. 116.



Twins; breech and vertex presenting. (AHLFELD.)

Twins are not always born at the same time; and if the second bag of waters be not ruptured, the second twin may remain in the womb indefinitely if it has its own placenta. As a rule, however, both children are born at the same labor. The manner of birth with each twin is that which usually occurs in such presentations, and occasions no difficulty if labor be not interfered with.

The management of labor in twin-pregnancy consists in guarding against overdistention and lack of uterine contraction. The bag of waters which presents should remain unbroken until dilatation is complete. Labor should be carefully watched to see that the patient does not become exhausted during the first stage, which is often prolonged. During the second stage, if labor ceases, interference must be promptly undertaken in the interests of both mother and children. As soon as the birth of the first child occurs care should be taken to see that the uterus contracts promptly and thoroughly. Remembering that there may be but one placenta, the cord of the first child should be tied in two places and the cord severed between the ligatures. As long as there is no hemorrhage there is no necessity to interfere with the second twin, nor with the placenta of the first if it is not detached.

When it is found by examination that a second child is present, if its bag of waters is unbroken, delay may be practised sufficiently long to give the mother a little rest. As soon, however, as labor-pains begin the membranes should be ruptured. Delay during the birth of the second child is dangerous to the mother, because it favors uterine relaxation and hemorrhage, and to the child because of the danger that the cord may be pressed upon and asphyxia may result. It is better to deliver the second child promptly as soon as nature makes the effort. After the delivery of the child a short delay may be practised to enable the mother to expel the second placenta. If spontaneous efforts do not succeed, no time should be lost in expressing the placenta. Ergot may then be given, and, if the mother shows signs of exhaustion, one-twentieth grain of strychnine may be given by hypodermatic injection. The womb should then be rubbed until it contracts firmly and the patient kept as quiet as possible.

The complications of labor in twin-pregnancy result first of all from weak uterine contractions caused by overdistention of the uterus, which may necessitate the application of forceps or extraction of the children. In cases of multigravidæ labor may be so rapid that hemorrhage is threatened by the sudden emptying of the uterus. Should labor cease by reason of impaction of the twins, the patient should be anæsthetized to surgical anæsthesia and the hand introduced to dislodge the children. The choice of version or the forceps will depend upon the conditions present as ascertained by examination with the entire hand. If one child can be pushed up and the head of the other brought into the pelvis, the forceps should be applied to the head which presents. Should the head of the second child not follow promptly, it may be necessary to bring the head down by suprapubic pressure, then delivering it with forceps, or it may be necessary to perform version.

In cases where the children are dead and the mother has been unassisted in labor for some time, it may be indicated to perform embryotomy upon one child to deliver both. If there is reason to believe that septic infection of the uterus has occurred, and impaction of the children is present, delivery by abdominal section, followed by hysterectomy, will give the patient the best chance for recovery.

The prognosis for twin-children depends upon the complications of labor and the strength and development of the children. Appliances should be at hand for resuscitating a child in each twin-labor, because of the danger of pressure upon the cord in some of these cases. Small and weak twins should be kept in an incubator for six weeks or two months after birth. They may be fed by milk from the mother's breast, dropping it into the mouth by a pipette. It is also well to bandage such children in cotton and to avoid exposing them by a full bath until they have increased in strength.

Labor where more than two children are born does not differ to any great degree from twin-labors. The children being smaller, their birth is usually easy. The greater distention of the uterus tends to cause weak labor-pains and requires additional watchfulness to prevent hemorrhage. The children are often puny, and it is rare for more than two to survive and flourish.

SECTION II.

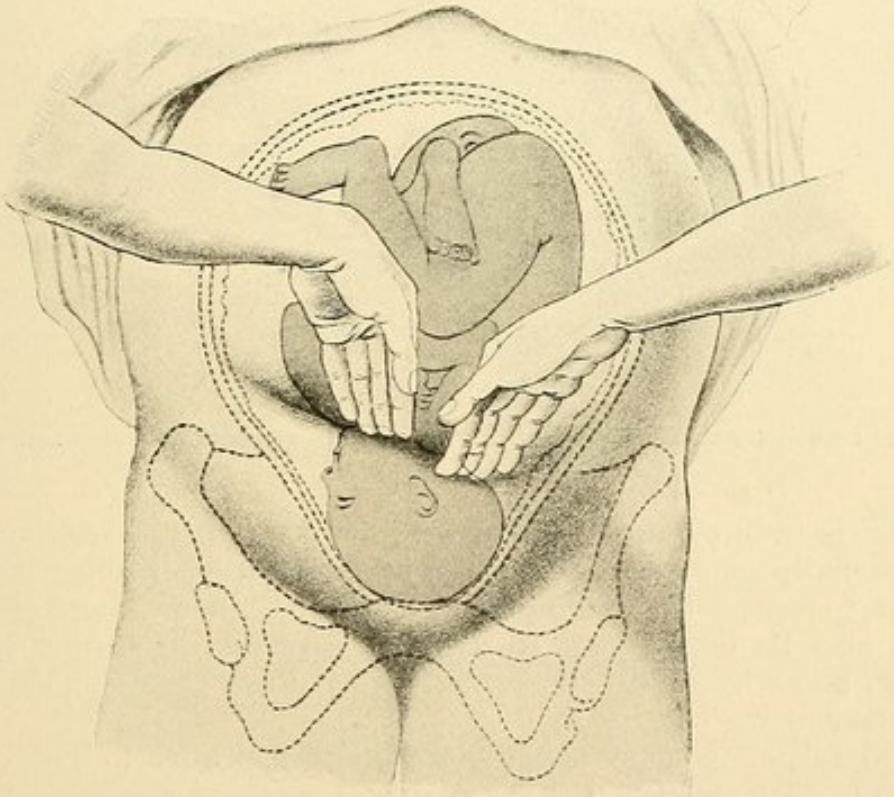
PATHOLOGY OF LABOR.

CHAPTER I.

INDUCTION OF LABOR.

It is sometimes necessary to interrupt pregnancy and terminate gestation. If this be done before the fœtus is viable, it is known as therapeutic abortion. After the period of viability it is termed induced labor.

Fig. 117.



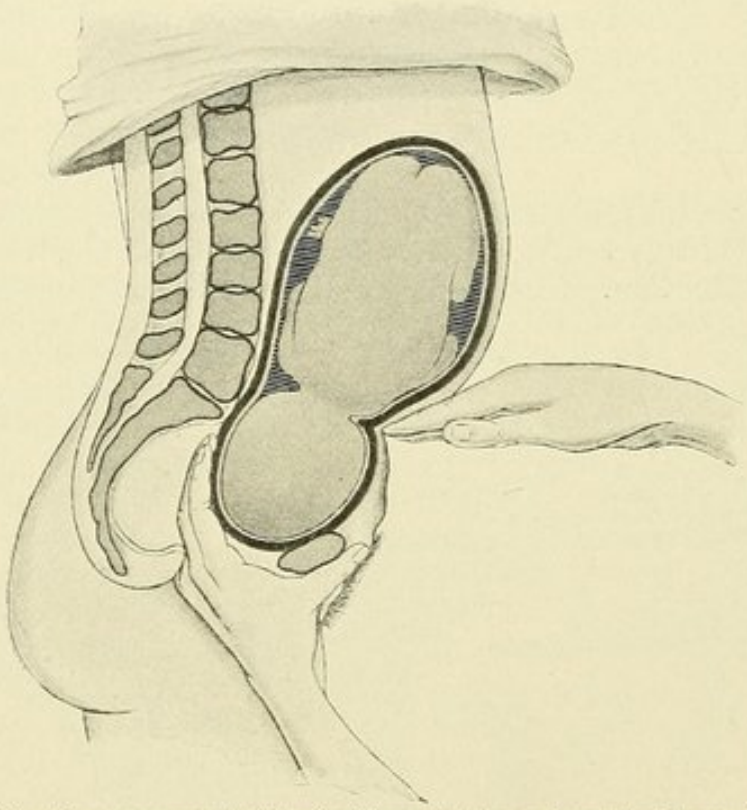
Determining the engagement of the head. (Beuttner.)

The reason for inducing labor is danger to the life of the mother or to that of the child. Where pregnancy is complicated by abnormalities which threaten the mother's life, and where the termination of pregnancy would give ground for hope that she might recover, gestation must be ended. In other cases it is found that some complication exists in the mother which will render the birth of her child at term

impossible. Gestation must be terminated at a selected time in these cases in the interests of mother and child.

Cases of contracted pelves in which labor is induced are examples of this latter class. The interruption of pregnancy at any time is a matter of serious importance, and the physician must be sure of his ground before having recourse to such a step. The description of induced abortion, or therapeutic abortion, as it is often called, will be given in treating of abortion.

FIG. 118.



Determining the engagement of the head by palpation and combined examination. (BEUTTNER.)

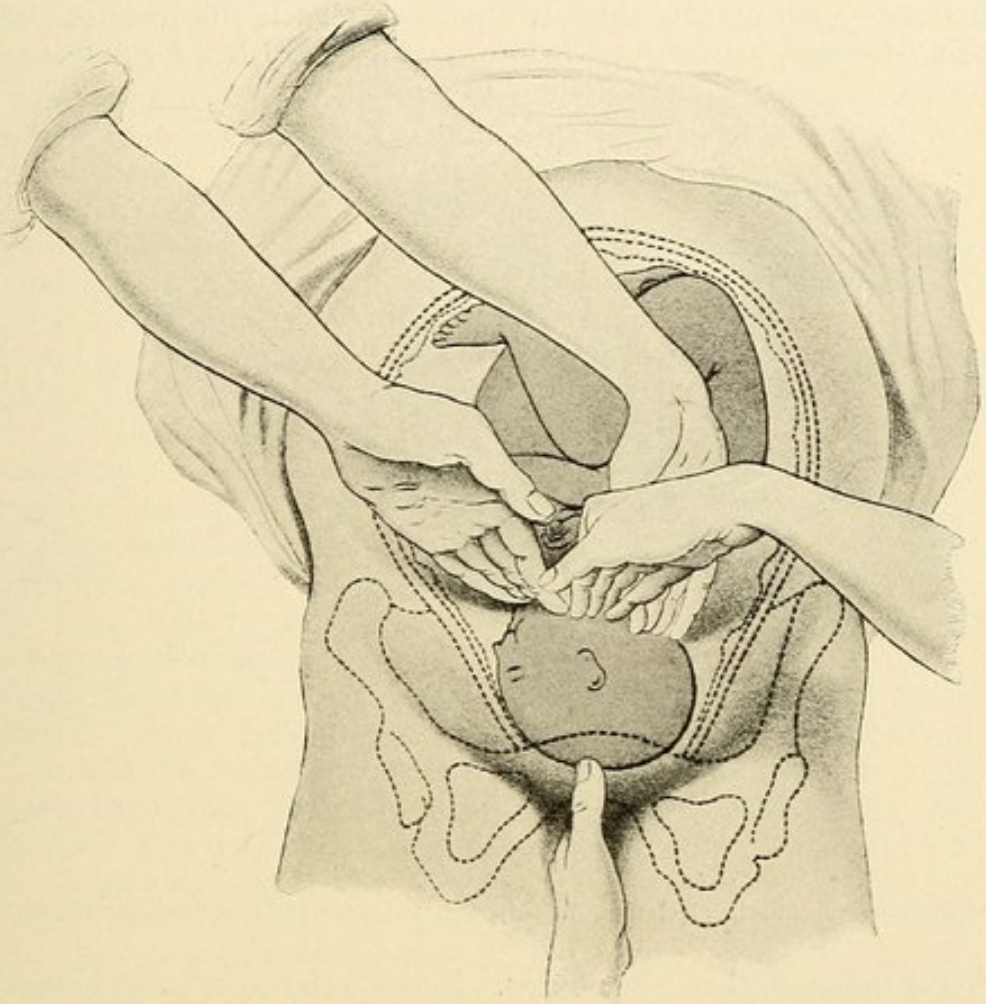
Labor is induced in contracted pelves whose antero-posterior diameter internally is 8½ cm. (3½ inches) or more, when the head can be brought to engage by manipulation, if needed, under anæsthesia. It should also be brought on in cases of toxæmia, in severe cases of insanity, and where heart-disease or rapid phthisis threatens the life of the mother.

Induced labor is more dangerous than normal birth to both mother and child. The dangers for the child, however, if antiseptic precautions are taken, are far greater than are those of the mother. In the hands of those practising antiseptic operations the induction of labor has no direct mortality-rate for the mother. The practice of incubation and additional knowledge in infant-feeding have very greatly reduced fœtal mortality following induced labor.

To prepare for this operation the same care should be exercised which is employed before abdominal section. The patient should be kept in bed for several days, the bowels thoroughly moved, the skin

repeatedly cleansed with soap and water and with ammonia or alcohol and water. The vagina should be thoroughly cleansed with soap and creolin, while every precaution should be taken to secure clean surroundings for the case. In women suffering from toxæmia, in addition to thorough purging, milk-diet is best for several days, with repeated hot packs to secure elimination.

FIG. 119.



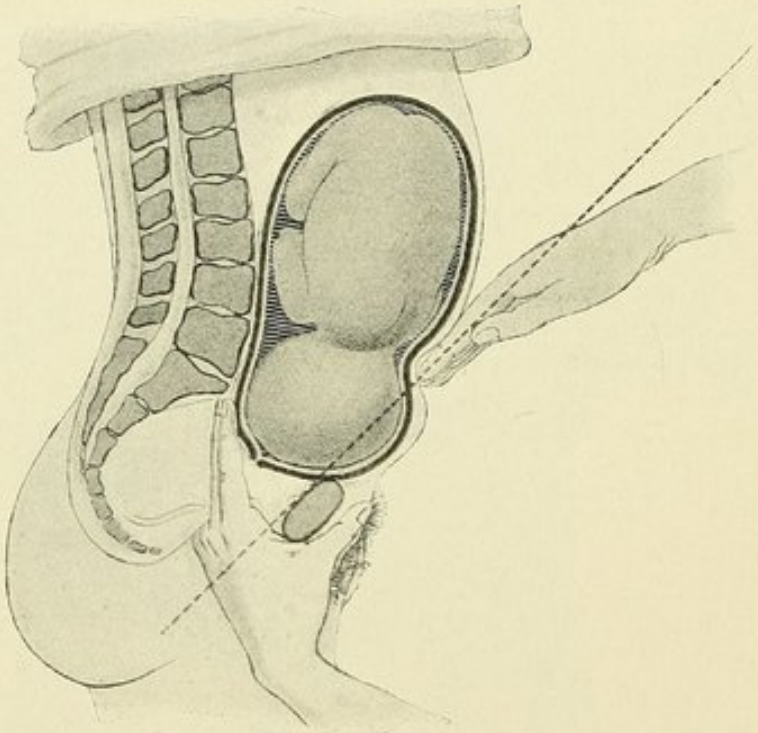
Determining the engagement of the head by palpation and combined examination with the aid of an assistant. (BEUTTNER.)

Special care must be taken with everything which touches the patient, that it be thoroughly aseptic.

Numerous methods have been tried for inducing labor. The rupture of the membranes has been practised. Irritating the breasts to secure uterine contractions has been tried in some cases. Repeated vaginal douches, the application of electricity, the injection of irritating substances into the uterus, and dilatation of the cervix have all been employed. The method which has given the best results and which is to be advised in most cases consists in the introduction within the uterus of aseptic, flexible, and solid bougies. These may be made of various substances, and have been coated with glycerine or other applications. The best bougies, however, for this purpose are solid,

moderately flexible, of medium size, and enveloped with silk, covered with a smooth and impervious coating. A hollow bougie should not be used. They should be prepared by scrubbing them with soap and water, rinsing them thoroughly, and soaking them for twenty-four hours in creolin, 2 per cent., or bichloride of mercury, 1 : 1000. Although an anæsthetic is seldom needed for the introduction of a bougie, still it should be ready, and preferably chloroform should be employed. In addition to a half-dozen bougies, the operator will need a moderate-sized uterine dilator, a pair of tenaculum forceps, uterine dressing-forceps, a speculum, iodoform-gauze, and bichloride-gauze.

FIG. 120.



Carrying the head into the pelvic brim by palpation and combined examination. (BEUTTNER.)

A T-bandage will also be needed. Some prefer to use a speculum and to expose the os and cervix before introducing the bougie. It is better, however, not to do so, because the speculum often holds the cervix in a fixed position and prevents the easy introduction of the bougie.

The patient should be placed across a bed upon her back or upon her left side. An assistant is useful, but not indispensable. If the head of the child is low in the pelvis, it may be necessary to raise it with one hand or to instruct an assistant so to do. This is to be accomplished by external manipulation. The operator should thoroughly cleanse his hands, and having douched the vagina with creolin, or carbolic acid, 2 per cent., he should pass two fingers of the left hand beneath the os and cervix. A bougie should be taken in the right hand and passed along the fingers of the left upon their palmar surface. As the bougie enters the cervix it should be given a gentle, rotating motion, which will usually assist greatly in its introduction. No force can be employed, but the introduction of the instrument should be accomplished

by patience and gentle manipulation. The bougie should be inserted until but three or four inches of its length remain outside the external os. It is usually better, if possible, to introduce a second, beside the first. When two have been inserted the vagina should be moderately tamponed with antiseptic gauze, the gauze being packed about the ends of the bougies in such a way as to prevent their emerging from the uterus. It is well to insert bougies, if possible, in the early evening, because the first processes of labor—softening of the cervix and gradual dilatation—often come on without the patient's knowledge, and need not prevent her sleep. It will be found upon examination the following morning that the cervix has become thoroughly softened and the os considerably dilated, while the patient has been passing a fairly comfortable night.

In the introduction of bougies failure will be experienced if the bougies chosen are poorly made and excessively flexible. Such an instrument will double upon itself and may deceive the operator, who imagines that it has passed within the uterus.

It will also be unfavorable to the progress of labor if the membranes should be ruptured during the introduction of a bougie.

If the induction of labor is begun at evening, the physician should see his patient twelve hours afterward, during the following forenoon. The gauze should then be removed, the vagina douched with creolin, the bougie removed, cleansed, and again introduced. If sufficient dilatation be present, two others may be added. As a rule, however, active labor will begin in from three to six hours after the second introduction of bougies.

When dilatation has advanced sufficiently far to permit the introduction of two or three fingers within the os, and the cervix is obliterated, it will be found advantageous to use elastic dilators, such as Barnes's bags and McLean's double bag or the large silk bag of de Ribes. The bag to be introduced should be folded upon itself, made thoroughly aseptic by creolin, which acts as a lubricant, and carried within the os in the grasp of the dressing-forceps. The bag should then be distended by creolin, 2 per cent., or bichloride of mercury solution, 1 : 10,000. The outer end of the tube may be closed by hæmostatic forceps, which are laid above the pubes and held in position by a light bandage. Ordinarily the effect of one of these dilators is secured in an hour after its introduction. If Barnes's bags are used, the first should be removed and the larger one inserted; if McLean's bag is employed, it should be more fully distended, each half being injected; for such injections a piston-syringe is required, as the force of gravity is not sufficient to distend the bag. Either of these elastic dilators may remain in place until spontaneous expulsion or delivery of the child. After their removal the membranes are ruptured and labor is terminated. When dilatation is complete the operator may at once secure delivery by either version or forceps, as the indication demands.

In cases where the os and cervix are very small and tightly closed, it may be impossible to introduce bougies within the uterus. An effort should at first be made to begin dilatation with the tip of the finger.

If the external os can be opened at all, a narrow strip of antiseptic gauze may be packed into the os, carrying one end of the strip as far as possible into the cervix. This should be removed and another applied every three or four hours. Where haste is not imperative, sufficient dilatation can be secured by these means to permit the introduction of bougies or even to secure full dilatation.

Labor must often be brought on in cases where haste is absolutely necessary. In eclampsia no time can be wasted in gradual dilatation with bougies. The os and cervix must be stretched at once by the fingers sufficiently to permit the introduction of a large elastic bag. In cases where such dilatation is impossible by reason of a narrow and firm condition of the tissues it is well to employ the method of incision into the os and cervix. This is best performed by angular scissors, introducing one blade within the cervix while the other cuts from without inward.

Four incisions are usually needed—one above, one below, and one upon each side, dividing the circle of the os into four quadrants. It is best to carry the scissors to the internal os and to go through the entire length of the cervix in these incisions. The result of this procedure is most satisfactory. It is found that if the incisions are carried as far as indicated, the bleeding is but slight and transient and that the uterus does not tear above the incisions, the internal os dilates at once, and delivery can be performed in a very short time. If the operator is without angular scissors, he may use a probe-pointed bistoury.

In cases where the os and cervix are soft and readily dilated the physician may succeed in dilating the os and cervix with the fingers sufficiently to allow him to carry his hand, folded into a cone, within the uterus. He may then perform version or insert narrow-bladed forceps.

The induction of labor calls for especial care in the maintenance of strict antisepsis. The frequent manipulation to which the patient is subjected, and the fact that the os and cervix are not in that physiological condition which favors dilatation, and hence sustain more or less injury during artificial labor, expose the patient to unusual risk. Scrupulous attention must, therefore, be given to every detail of antisepsis.

In well-selected cases under good care induced labor of itself has no mortality for the mother. It may be performed too late to save her from some dangerous condition, but the operation itself in proper hands is a safe one.

The risk to the child, however, is considerably increased. If labor be induced some weeks before the normal end of gestation, the child is not fully developed, and hence has not the resisting power of the infant at term. Because the os and cervix are not soft and ready to dilate, the child may be subjected to fatal pressure if delivery is attempted before dilatation is complete or without suitable incisions. Prematurely born infants often require incubation and artificial feeding. These disadvantages, however, are not insurmountable, and can be overcome with careful attention.

The prognosis for the life of the child delivered by induced labor will depend upon the period of gestation at which the operation is

done, the strength of the child, and the care which it receives. If such a labor be properly managed and the child well cared for, the majority of such children are saved.

The induction of labor should not be undertaken in cases where life is at once threatened without full understanding with the parents or friends of the child, and with the knowledge that the operation is one which is mainly in the interest of the mother. With the good results obtained by surgical delivery the mother must be informed that she has a choice in some cases between exposing her child to the risks of premature birth or assuming herself a greater danger than normal by surgical delivery at full term.

CHAPTER II.

ABNORMAL LABOR-PAINS.

Rigidity of the Birth-canal.

THE term labor-pains includes involuntary contractions of the uterus, supplemented by voluntary contractions of the abdominal muscles and all other accessory muscles. That these various groups of muscular tissues should act efficiently several conditions must be present. Good muscular development is essential, while healthy nervous stimulus must also be present, with sufficient general strength on the part of the mother to maintain muscular activity. The most frequent deviation from this condition is to be found in weak labor-pains or deficient expulsive force. These are most frequently seen in women of poor muscular development, with susceptible nervous systems and often impaired nutrition. Many of these are primigravidæ and some of them are young.

The depressing effect of the emotions is often seen in delayed labor in cases where a profound mental shock seems to check completely action of the uterus. Among the most common causes of weak labor-pains is excessive sensitiveness or susceptibility to suffering, which inhibits the muscular contraction of the uterus through its impression upon the cerebral centres. Exhaustion is always a cause of deficient labor-pains which must be promptly recognized.

The contrast between delayed labor from excessive sensitiveness and suffering, and weak pains from exhaustion, is best presented when the patient is given small doses of an anæsthetic. In cases where the dread of pain is delaying labor, as soon as suffering is relieved the contractions of the uterus begin and go on at regular intervals and with increased strength. On the other hand, if the patient is physically exhausted, the pulse will be rapid and weak, and a few whiffs of an anæsthetic will cause labor-pains to cease entirely rather than to increase.

The treatment of these two conditions must be radically different, and hence it is important that they be clearly recognized.

The treatment of weak labor-pains consists in giving the patient such general support and care as shall keep her in good general condition. She should not be allowed to become exhausted for lack of food or sleep. Her strength should not be wasted in fruitless efforts to bear down and expel the child. She should be kept in as comfortable a posture as possible and everything done to sustain and comfort her.

Second in importance in treating weak pains is the proper use of those agencies which mitigate suffering. It is most important that the physician make a thorough examination to be sure that no mechanical obstacle exists to delivery. This is often impossible without a slight degree of anæsthesia. If chloroform or bromide of ethyl be inhaled until sensation is partly destroyed, the size and position of the presenting part and the condition of the mother's birth-canal may be clearly ascertained. If exhaustion be present, the uterus will be found tightly contracted upon the child if the membranes have ruptured. The anæsthesia will have no further effect upon such a condition than to cause uterine contractions to cease entirely. If, however, the patient is simply prevented from having good pains by the sensation of suffering, under partial anæsthesia and the manipulation necessary in an examination uterine contractions will grow stronger.

If the membranes are unbroken and labor-pains are deficient, one of two sedatives may be employed to secure a proper action of the uterus or to give needed rest. To allay suffering from nervousness, chloral is to be selected and given in doses of ten grains every hour until three or four have been taken. If, however, the patient is exhausted and yet cannot sleep, morphine and atropine may be given by hypodermatic injection to advantage. It is well to give a stimulant, as whiskey or brandy, by rectal injections, combined with milk or egg, in these cases. If the patient can sleep several hours, she will recover her strength and labor will go on. In cases where exhaustion is but beginning and a tonic is required sulphate of quinine may be given as indicated to the amount of fifteen to twenty grains. This can often be retained when combined with scale pepsin given in capsules, each containing two grains of quinine and one of pepsin. It is generally possible to give broth or milk with each capsule, thus securing additional nourishment.

If, however, the membranes have ruptured and labor-pains are weak, while no obstacle exists to delivery, delay should not be practised. The head may be brought into the pelvis and well down within its cavity by external manipulation. If the uterus be rubbed at the fundus at regular intervals until it contracts, and then the head be pressed downward and backward at the brim of the pelvis by the hands of the physician, the head will be forced down within the pelvic cavity. When this has occurred and the head has reached the pelvic floor, the application of forceps may properly terminate the labor.

Especial care must be taken in these cases to guard against relaxation of the uterus and bleeding after delivery. As soon as birth is

completed a hot intrauterine douche of a diluted antiseptic solution should be given, accompanied by a hypodermatic injection of strychnine, one-twentieth of a grain. In using the forceps in these cases ether is the best anæsthetic, because it most powerfully stimulates the nervous system and uterine contractions.

In cases where the membranes have ruptured, the patient not being at all exhausted but complaining greatly of suffering, an anæsthetic should be given, as indicated, to stimulate labor-pains. For this purpose chloroform or bromide of ethyl may be used in small amounts at regular intervals. If the uterus be rubbed and a little chloroform inhaled, uterine contractions will become stronger and grow regular in these cases. Others prefer ether, giving it in small quantities continually until delivery occurs.

The reflex stimulation to uterine contractions resulting from pressure upon the pelvic floor may often be utilized in cases of delayed labor by bringing the head down upon the pelvic floor with forceps, removing the instrument, and allowing the birth to terminate spontaneously. For this purpose partial anæsthesia is required, and the inhalation of ether sufficient to enable the obstetrician to perform this manipulation assists greatly in terminating the labor. If done under antiseptic precautions and with skill, this use of the forceps is strictly justifiable and does not add in the least to the morbidity or mortality of mother and child. The forceps in these cases is to be applied, if possible, to the sides of the head; but if this cannot be done because of the failure of rotation, if the forceps be applied to the sides of the pelvis and gentle traction be made in the axis of the pelvis, rotation will readily occur and the head will descend upon the pelvic floor in its usual position.

Cases are occasionally seen in which uterine contractions are so violent as to complicate labor. These occur in strong and muscular women, and are often seen in cases where the child is large and exceedingly well developed. The management of these patients requires that they be made to lie down as soon as the membranes rupture. In normal cases the patient should lie upon her left side, flexing her thighs to avoid bracing herself with her feet. She should also discontinue any efforts at straining and should breathe with the mouth open. Here, again, an anæsthetic, such as chloroform, is of great use in enabling the physician to control the progress of labor. As labor proceeds it may be advisable to apply forceps and maintain strong flexion of the head to avoid rapid birth, with partial extension. Excessively strong pains may injure the mother by tearing her and harm the child by bruising it.

Where uterine contractions are excessively strong and the mother is almost unmanageable through pain, the physician can best control the case by turning the patient upon her left side, flexing her thighs, giving chloroform as rapidly as possible, and placing one hand over the vulva and the other above it and holding strongly upward and backward. This does not require the insertion of the finger into the vagina, and so does not expose the patient to the risk of infection. As soon as partial anæsthesia is obtained time is given to govern the expulsion of the head and to secure the proper mechanism of labor.

Rigidity of the soft tissues of the birth-canal may furnish a serious obstacle to labor. A very long and narrow cervix with strongly resisting tissue at the internal os may delay the birth of the child for hours. A strong pelvic floor and tight perineum may also render birth very difficult. In these cases it must be remembered that the muscular tissues of these parts are directly under nervous control. Spasmodic contraction of the fibres about the os may be relaxed by the use of a sedative addressed to the nervous system.

The following formulæ have been found useful in these cases :

Hydrate of chloral		grs. 30.
Warm milk Warm water	each	℥ 2.

To be given by rectal injection.

Also :

Aqueous extract of opium	gr. 1.
Extract of belladonna	gr. ½.
Iodoform	grs. 5.

Cocoa-butter sufficient to make two rectal suppositories.

One of these to be inserted as soon as received, the other four hours afterward if needed. Sulphate or phosphate of codeia may also be used by the mouth or by hypodermatic injection, in doses of one-fourth of a grain, repeated, if necessary, in two hours.

When, however, structural changes have made the tissues denser than normal mechanical forces must be brought to bear to stretch them. Some have found benefit in repeated hot douches to soften the tissues of the birth-canal. In other cases stretching the parts with the fingers, followed by the insertion of an elastic bag (Barnes's, McLean's, or de Ribes's), has given good results. When, however, the obstacle to delivery cannot be overcome by these means the case should be treated by incision under antiseptic precautions. Where the obstacle lies at the external os it is usually sufficient to make from four to six short incisions around the edge of the os with a probe-pointed bistoury. These cuts are but nicks in the tissues, yet often produce most favorable results.

Where the pelvic floor and perineum are unyielding the head may be brought down upon the pelvic floor by forceps, the patient being under an anæsthetic. Double episiotomy may then be made and the head delivered with forceps. The incisions should be immediately closed with continuous or interrupted suture. In dilating the pelvic floor and perineum with the presenting part care should be taken to make very gentle traction and to push back the head after each traction. If the forceps is applied to the sides of the head, flexion can be maintained in this way to greater advantage than by manipulation with the hand. If the head is delivered very slowly, relaxing the grasp of the forceps between each traction, injury to mother and child is avoided and a favorable delivery is usually possible. Some prefer to bring the head down upon the pelvic floor with forceps and then remove the instrument, allowing birth to occur without it. While this course results well in many cases, in patients with whom the parts

have been rigid and unyielding the presence of the head upon the pelvic floor sometimes sets up spasmodic and strong expulsive efforts, the result being to force the head over the pelvic floor and through the vagina before sufficient time for dilatation has elapsed. This is prevented if the head is delivered with forceps when it is under the absolute control of the operator.

It occasionally happens that the cervix must be completely incised to secure rapid dilatation. This may be done by the use of blunt-pointed angular scissors, with which four cuts may be made extending to the internal os. Under strict antisepsis the incision of the cervix or perineum is a most efficient method and should be followed by no bad results.

CHAPTER III.

HEMORRHAGE BEFORE, DURING, AND AFTER LABOR—CONCEALED HEMORRHAGE—PLACENTA PRÆVIA.

Bleeding occurring before labor may be readily recognized when the blood escapes from the vagina, or hemorrhage may be concealed. In either case it is a dangerous complication of pregnancy, and necessitates a thorough study and careful treatment of the case.

Concealed hemorrhage occurs from a partial separation of the placenta from the wall of the uterus. It may also follow a diseased condition of the lining membrane of the uterus. If the membranes are unruptured, the blood will not escape through the vagina, but will be retained within the membranes. In other cases a diseased condition of the blood in the lining membrane of the uterus causes pathological changes in the endometrium and passive bleeding. It is evident that the only symptoms which this complication may cause are what may be termed constitutional symptoms of bleeding. They are a rapid, weak pulse, a cool, clammy skin, a restless and anxious expression, with pallid face, thirst, and impaired vision. Upon palpation the uterus will be found softer than normal. Fœtal movements at first are more frequent and vigorous and gradually ceasing. Fœtal heart-sounds are obscured and faint. The uterus increases in size from accumulation of blood-clot within it. It loses its contour and gradually becomes softer and more flabby than usual.

When called to such a case the physician should remember that separation of the placenta may follow a fall or blow or any other injury to the abdomen in a pregnant patient. If there is no history of such injury, examination by palpation and auscultation will reveal the conditions described. Upon internal examination, if the os will admit the finger, the membranes will be found filled with a soft, doughy mass, which is clotted blood.

The treatment of concealed hemorrhage requires the greatest watchfulness and skill. If the mother's pulse is below 100, the fœtal heart-sounds strong, and the uterus but little relaxed, the patient should be put at absolute rest with the hope that the bleeding will cease. Opium may be given in very moderate doses to allay nervous excitement. Unless, however, the patient improves very promptly and symptoms of danger disappear, pregnancy must be interrupted in the interests of the mother.

The first and most important procedure consists in rupturing the membranes and allowing the amniotic liquid partially to escape, in order that the uterus may be made to contract closely upon the body of the child. To accomplish this the vagina must be made aseptic. The physician's hands must be thoroughly cleansed and the fingers of the left hand passed beneath the os and cervix. The os should be dilated as much as is possible with the finger and the membranes then ruptured by a closed pair of uterine forceps. Labor will usually follow and uterine contractions very soon begin. If dilatation be slow, an elastic dilator may be inserted to advantage or iodoform-gauze may be firmly packed into the cervix. The uterus must be stimulated to contraction by friction, by quinine, and by small doses of ergot. The mother's strength must be supported by rectal injections of stimulants combined with milk, broth, or eggs Labor must be completed as soon as possible, the uterus thoroughly emptied, cleansed with a hot antiseptic douche, and made to contract. Strychnine should be freely given if needed.

In cases where the os and cervix are so resisting that dilatation does not occur, incisions must be promptly made and the uterus emptied.

It is scarcely possible in these cases to save the life of the child, and the interests of the mother alone should be considered. If prompt delivery were practised by abdominal incision, mother and child would often have the best chance of recovery. This is possible only in hospitals and with all surgical appliances at hand. In private houses the practitioner should remember to dilate the uterus, rupture the membranes promptly, stimulate freely, and secure delivery as soon as possible. Unless these cases are studied thoroughly by palpation and auscultation, they are often unrecognized until so late that the patient's condition is critical. The mortality-rate for the mother is 50 per cent. at a low estimate, while for the child it is practically 100 per cent. These patients are especially exposed to the dangers of septic infection by reason of the bleeding and shock to which they are subjected.

Hemorrhage during labor is usually occasioned by a laceration of the soft parts of the birth-canal. The placenta may also become partially or wholly detached during the progress of labor. If the cervix be so badly torn as to cause bleeding, the patient should be delivered as rapidly as possible and the torn surfaces brought together by sutures at once. To close a recently torn cervix the operator requires chromicized catgut or sterile silk, full curved needles, needle-holder, scissors, and, in some cases, tenaculum forceps and retractors. The patient is placed upon her back or upon her left side, at the edge of a bed or table; the vagina is thoroughly douched with hot antiseptic solution,

preferably bichloride, 1 : 5000; the instruments and hands of the operator are rendered sterile, and the field of operation is surrounded by sterile towels. An anæsthetic is rarely absolutely necessary, as the recently torn cervix is not sensitive and the genital tract immediately after labor is capable of less sensation than before delivery. An assistant should compress the uterus so that manipulation upon the cervix shall not cause relaxation and set up bleeding. As the pelvic floor is usually torn in these cases, it will be necessary to close it also by suture; and if the tear is extensive and the patient in good condition, if she has been delivered under anæsthesia, it is well to continue the anæsthetic during the suturing, giving an injection of strychnine, one-twentieth, should there be evidence of surgical shock. The parts having been exposed by retractors or specula, any torn or bruised tissue in shreds should be trimmed away from the edges of the torn cervix. If small vessels bleed, they should be seized with hæmostatic forceps and twisted. The torn edges should be brought together with the tenaculum forceps and sutures inserted, beginning at the highest point of the tear. Some prefer the interrupted suture and others the continuous. If the operator can be absolutely sure of the quality of the catgut which he uses, it is a very convenient way to close these lacerations by the continuous catgut suture. Unless, however, he is positively certain that the catgut which he uses is antiseptic and will not become soft readily, he will do much better to employ silk which has been boiled. A continuous suture of silk will often give excellent results. The suture should preferably not pass into the mucous membrane lining the cervix, but should go through the external, elastic, and muscular tissue of the uterus, bringing it neatly into apposition. In inserting the beginning of the stitches, if there is considerable bleeding, the stitch should be passed deeply and sufficiently high to grasp any branch of the uterine artery. The main vessel can sometimes be felt to pulsate, although its branches most often torn in labor can rarely be distinguished in that manner. When the cervix has been closed, the operator should proceed to close, if necessary, the pelvic floor and the perineum.

If the cervix tears before the advancing head, the tissues should be incised and dilatation promptly secured. If a bloodvessel be torn in a laceration of the pelvic floor or perineum, it should be grasped with forceps, twisted, and the wound promptly closed. If it is impossible to sew up such tears, the parts may be tightly packed with iodoform-gauze. Should the placenta become separated during labor rapid delivery is indicated, without regard to lacerations, in the interests of the mother and child.

Hemorrhage after labor is called post-partum hemorrhage. It may also be termed secondary hemorrhage in distinction from bleeding which occurs at labor. The primary cause of post-partum bleeding is relaxation of the uterus, which leaves the sinuses in the uterine wall open and permits bleeding to take place. Occasionally such hemorrhage occurs from a diseased condition of the womb, and more rarely the uterus, which has been well contracted, may relax after labor and bleeding result.

The symptoms of post-partum hemorrhage are a rapid, feeble pulse, considerably above 100; a pale, anxious countenance, hurried breathing, cold skin, sensation of darkness of vision and a lack of air, with restlessness on the part of the patient. If the abdomen be examined, the uterus will be found large and flabby or may be so distended that it cannot be outlined. Usually a copious flow of blood occurs from the vagina, but severe hemorrhage may take place and the blood be retained within the uterus by a large clot within the cervix. In favorable cases clots and fluid blood are discharged from the vagina. The uterus contracts and remains firm. The pulse falls below 100, the skin becomes warm, the patient takes food and stimulants, and gradually regains strength. In fatal cases it is impossible to secure firm contraction of the uterus, and the patient dies in shock.

FIG. 121.

Palpating the recently emptied uterus to determine its size and firmness.

The conditions which bring about post-partum bleeding are those which depress the patient and reduce her strength and those also which tend to weaken the uterine muscle and to prevent its firm contraction. Great mental shock at labor may bring on hemorrhage, as is seen in times of great public calamity, when women in childbirth often suffer

from this complication. Severe illness complicating labor predisposes to bleeding, as is seen in the acute infections which may attack the pregnant woman. Prolonged labor may exhaust the mother's strength and so weaken the uterus that it cannot contract. Septic infection may induce a profoundly altered condition of the blood and cause fatal hemorrhage several days after delivery. Profound anæsthesia and poisoning with irritant drugs predispose to bleeding. The rapid emptying of the uterus without sufficient time elapsing for this organ to contract favors hemorrhage.

FIG. 122.

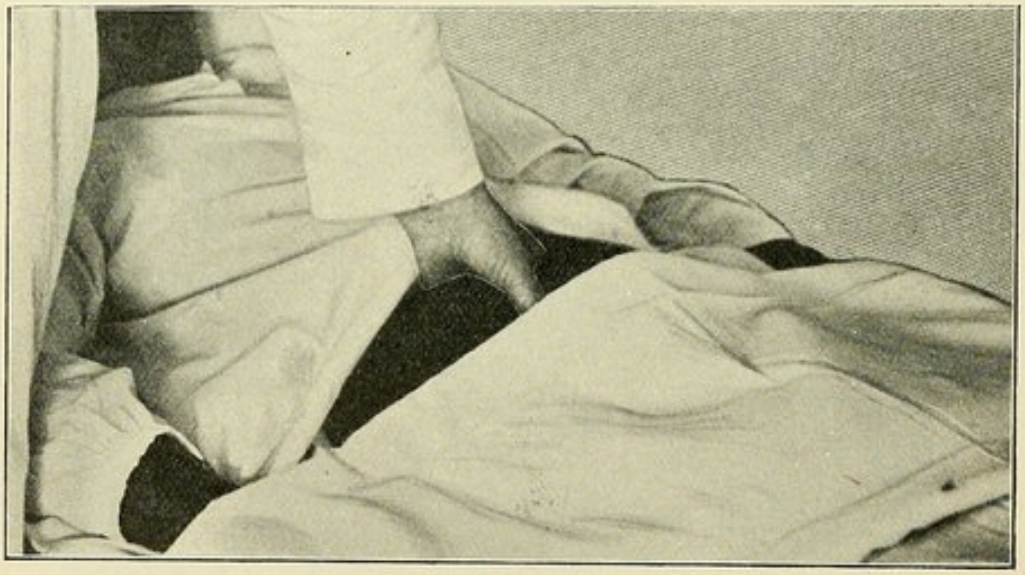
Incorrect method of grasping uterus to cause contraction. Ulnar border of hand may compress right ovary.

The treatment of post-partum bleeding is preventive in character. It is of the greatest importance that the strength of frail and delicate women should be carefully guarded. The child should be followed during its passage through the pelvis by the hand of the physician placed upon the fundus of the uterus. Haste should be avoided in delivering the placenta, and this should preferably be delivered by compressing the uterus. Anæsthesia should not be carried to a profound extent, unless in cases of tetanus of the uterus with threatened

rupture. If the forceps is used, delivery must be gradual and traction made during the pains. If turning and extraction are done, the uterus should be followed down as the body of the child emerges. But most important of all is the physician's duty to know personally by palpation that the uterus is well contracted after labor and that it remains so. Symptoms of shock and excessive fatigue must be carefully sought, and their presence will oblige the physician to remain with his patient until recovery takes place.

The active treatment of post-partum bleeding consists, first of all, in causing the womb to contract by manual pressure. The abdominal binder must be at once removed and the hands carried deeply into the abdomen above the uterus. The womb should then be kneaded vigorously between the hands, and as it grows smaller it should be grasped between the fingers, carried well down behind the fundus, and the thumb placed upon its anterior surface. The womb should be anteflexed, the fundus being carried downward and forward toward the pubic joint. Next in importance is the prompt removal from the womb of clots which pre-

FIG. 123.



Correct and efficient method of grasping uterus to prevent bleeding.

vent its firm contraction. The aseptic hand should be introduced into the vagina and clots promptly removed from the uterus. This should be followed by copious douching with hot water at a temperature of not less than 110° F. A special tube for this purpose is not necessary if, in default of a convenient tube, the hose of a fountain-syringe be washed and the end introduced within the cervix. If one hand compresses the uterus, no undue distention will occur.

The majority of cases of post-partum bleeding are stopped by these measures because uterine contraction is secured. There remains, however, the patient's weak and exhausted condition, without which bleeding could not occur, and which results from the hemorrhage. To combat this successfully stimulants must be addressed to the nervous

system, while easily digested food and diffusible stimulants must be promptly given. The best stimulant in these cases is strychnine, which may be given by hypodermatic injections in doses of one-twentieth grain until a third or one-half grain has been taken. In cases where respiration seems to flag atropine may also be injected in one or two doses of $\frac{1}{100}$ of a grain each. When the heart seems especially to fail several syringefuls of ether may be injected with advantage, and digitalis is indicated. Although alcohol is valuable, it is of less importance than the stimulants which have been named. In patients with whom the cerebral centres seem to be in a condition of exhaustion morphine may be given by hypodermatic injection with positive advantage.

In using ergot to check post-partum hemorrhage it must be remembered that the action of the drug is addressed to the uterine muscle and that the uterus may occasionally be firmly contracted and still hemorrhage be present. The value of ergot, then, is limited in these cases, and while it may be administered to advantage, it is of secondary importance to strychnine and to compression of the uterus and the hot douche.

The patient's blood-loss must be made good as rapidly as possible by transfusion. Experience has shown that a direct transfusion of blood is not often performed successfully, while it has no particular advantage over the free use of normal saline solution.

While in maternities and operating-rooms it is desirable to be exact in the strength of the solution employed, in emergencies at private houses it is quite sufficient to add a teaspoonful of table-salt to a pint of water which has been boiled, and so to use it.

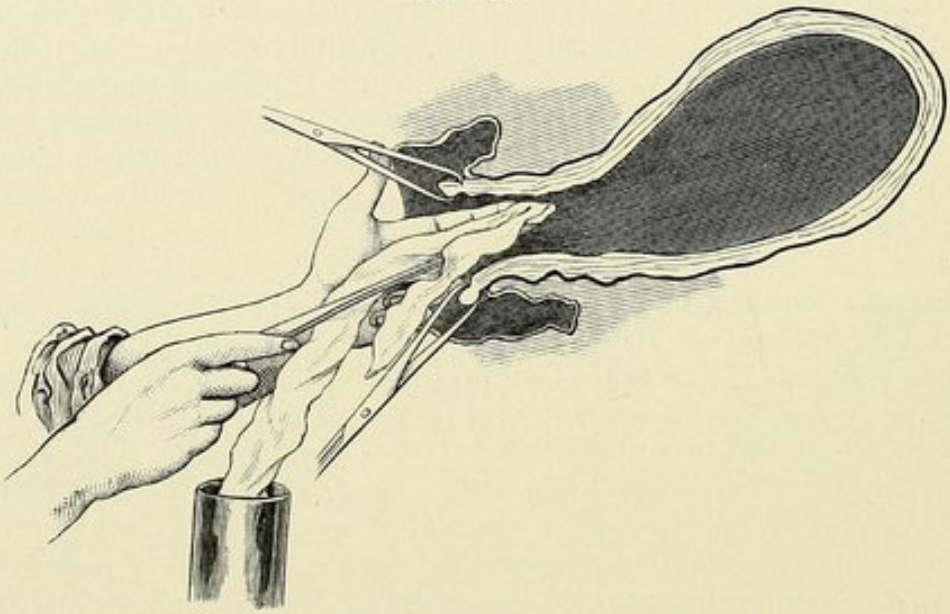
The fluid may be introduced into a vein if the operator has the necessary appliances for such a procedure, or a needle may be thrust into the connective tissue in the space between the large muscles upon the outer side of the thighs, at the sides of the chest, just above the clavicle, or any convenient region of the body. All that is needed is a clean fountain-syringe and transfusion-needle and the salt water to form the fluid. As to the amount of fluid which may be injected to advantage, this is limited only by the patient's power to absorb it. Several pints may be taken with positive gain.

Those general procedures which are employed in cases of surgical hemorrhage are required for these patients. The head should be low and a hot bottle, properly covered, placed beneath the base of the brain. Dry heat should be freely applied about the whole body. The patient may be partially inverted, but not in the absurd fashion so often practised, in which the foot of the bed is raised upon a few books or possibly one or two bricks. Unless the foot of the bed is raised from three to five feet from the floor the procedure is useless. The limbs may be tightly bandaged from the extremities upward to assist in retaining blood in the trunk of the body. Inhalations of oxygen and the use of electricity, one pole at the base of the brain or upon the dorsal region of the spine and the other over the womb, have been found of value. Food and stimulants may be well given by rectal injections in the shape of brandy and beef-juice, whiskey and milk, while suppositories containing musk have been found of service in some cases.

The physician must remain with his patient until he is personally assured that the uterus is well contracted, the hemorrhage entirely checked, and the patient in full reaction from shock.

In cases where the uterus is fairly well contracted, but shows a tendency to relax, or where the uterus is firm, but oozing is present, there can be no question of the value of the intrauterine tampon of antiseptic gauze. No case of labor should be attended without gauze being in readiness for such use. The strip should not be more than three inches wide and a yard long. The best time for its application is immediately following thorough emptying of the uterus by the fingers and copious douching with hot water.

FIG. 124.



Tamponing the puerperal uterus for bleeding. (DÜHRSSEN.)

The patient is then placed upon the back or side, the package of gauze opened, uterine dressing-forceps sterilized, and the fingers of the left hand made aseptic and introduced beneath the cervix. The end of the gauze is carried along the fingers and into the uterus and is inserted to the fundus. The uterus must not be distended with the gauze, for this would hinder contraction and favor the occurrence of bleeding. The presence of a single strip is often sufficient to excite uterine contraction. There can be no question of the value of this procedure when the gauze is properly and promptly applied. It should not be disturbed for twenty-four hours, an antiseptic dressing being worn over the vulva and the uterus being douched after its removal.

Post-partum bleeding may sometimes be checked by direct compression of the uterine and ovarian arteries or of the abdominal aorta. To effect the former the fingers of one hand should be introduced within the vagina behind the cervix and the cervix carried strongly upward and forward beneath the pubic joint. The other hand should grasp the fundus through the abdominal wall, bending the womb strongly forward over the pubes. In this way the arteries are compressed

as they enter the uterus. This is best accomplished by carrying the womb well down within the pelvic cavity at the same time.

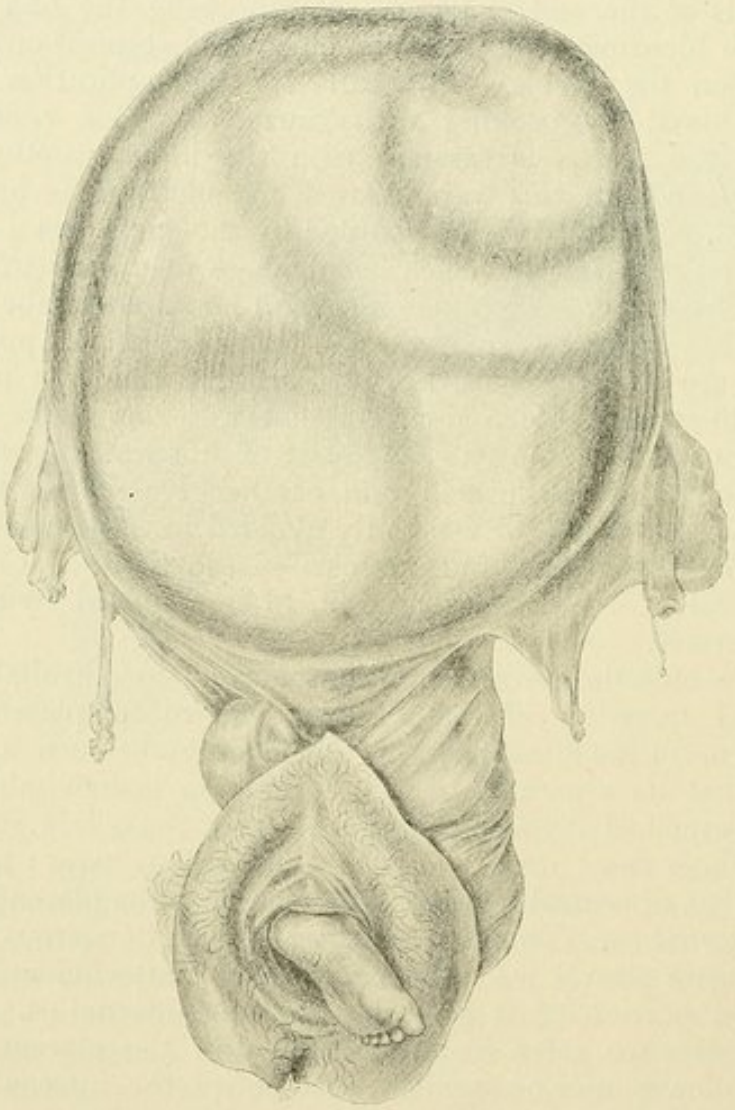
The uterine and ovarian arteries may also be ligated by abdominal section, followed by hysterectomy at the junction of the fundus and cervix. The abdominal aorta may be compressed against the vertebræ and the flow of blood to the uterus gradually lessened or cut off. Cases are sometimes seen in which the uterus is firmly contracted, but in which a persistent oozing of blood continues after delivery. In these cases the loss of blood is occasioned by a diseased condition of the small vessels of the endometrium. Compressing the uterus will not control such bleeding, and it can be effectually stopped only by direct pressure upon the vessels. This calls for the application of the hot douche, followed by packing with gauze. A good result is often obtained if the uterus is scraped with the blunt curette when the douche is given. In this way diseased endometrium is broken down and removed, and the pressure exerted by the gauze has a much more direct and positive effect. Such hemorrhage may persist for a day or two after delivery, or may come on several hours after labor, when the circulation has recovered somewhat its equilibrium. Applications of astringents are sometimes used in these cases. The best of these are alum, a tablespoonful to a quart of hot water or gallic and tannic acids, to be used by adding to one quart of hot water a tablespoonful of the glycerite of gallic acid and of the glycerite of tannic acid. The use of iron should be especially avoided in these cases, as it distinctly favors thrombosis and necrosis of the tissues. Carbolic acid is often useful in 5 per cent. solution, to be followed by a douche of simple hot water.

One of the most dangerous conditions causing uncontrollable bleeding is abnormal insertion of the placenta, known as placenta prævia. By this we mean the attachment of the placenta to such a portion of the womb that its separation during dilatation is inevitable. If the placenta be attached at the lower segment or at the cervix, it is placenta prævia. These cases may be classified in various ways; an ordinary division is that of central placenta prævia, when the placenta is directly over the internal os. This is naturally the most dangerous of all. By partial placenta prævia we understand such an attachment of the placenta that a portion of it projects over the internal os. By lateral placenta prævia we refer to an attachment of the placenta upon the wall of the lower uterine segment, just above the internal os; while by marginal placenta prævia we understand the situation of the placenta at the margin of the internal os. While these different varieties are not always perfectly developed, still the classification is of use in studying these complications.

The causes of placenta prævia are found in a relaxed condition of the uterus and an abnormal state of its lining membrane, which permit the impregnated ovum to descend to the lower portion of the womb, instead of becoming adherent and developing in its normal situation. Women who have borne children rapidly are liable to placenta prævia, while primigravidæ of poor development and relaxed uterus seem also predisposed to this complication.

The symptoms of placenta prævia are hemorrhage during pregnancy. The period of pregnancy at which the bleeding will occur depends upon the situation of the placenta. Thus, in central placenta prævia bleeding may take place as early as the fifth or sixth month of gestation, while in other cases where the placenta is higher up no blood may be lost until labor actually begins. The way in which bleeding occurs from this condition is significant and should arouse suspicion. There

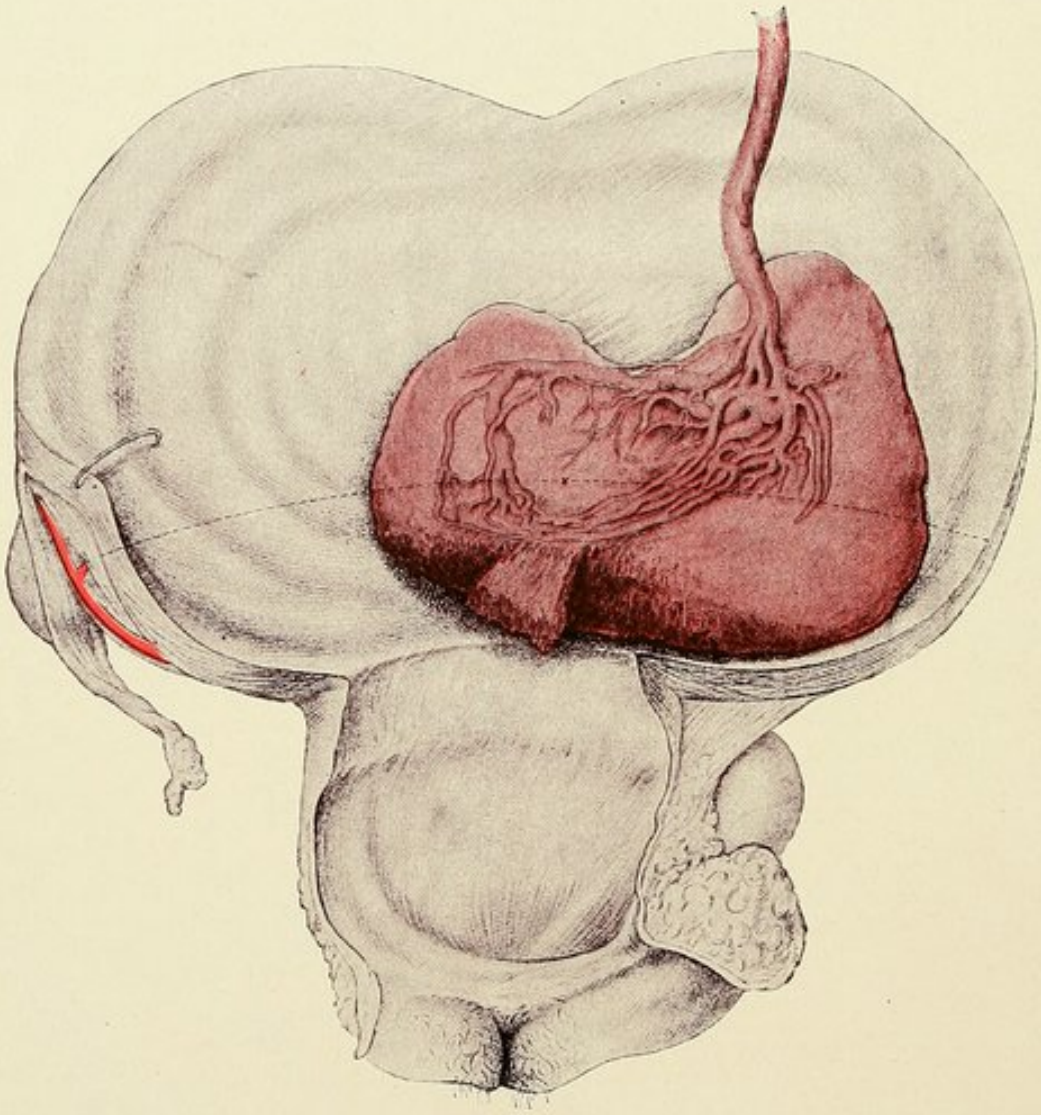
FIG. 125.



Placenta prævia and breech presentation. Placenta in lower uterine segment and internal os. (RUNGE.)

is no history of violence nor strain in these cases. The patient often finds that when the bowels or bladder are emptied, and without difficulty, that bright red blood is suddenly discharged without pain. A little care will enable the physician to distinguish between blood from hemorrhoids and blood from placenta prævia. As pregnancy advances this bleeding is more frequent, and, if the placenta is central, it increases in amount. It may finally become continuous and the patient perish in a few hours unless promptly treated. In other cases where the

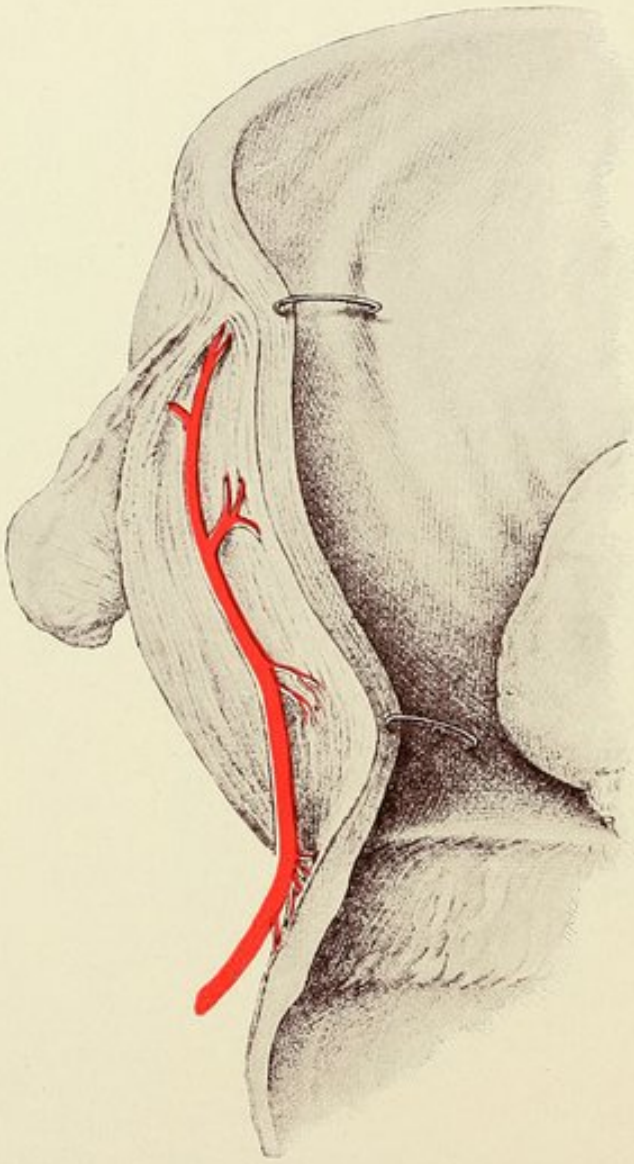
PLATE IX.



Central Placenta Prævia. Version and Extraction. Death of Mother from Anæmia. (RUNGE.)

Showing placenta and large size and course of uterine artery.

PLATE X.



Side View of Figure shown in Plate IX., showing large Uterine Artery. (RUNGE.)

placenta is higher the discharge of blood is often slight and may occur at considerable intervals. The amount may not be sufficient at any one time to occasion anxiety. (Plates IX. and X.)

FIG. 126.

Placenta prævia and breech presentation. Placenta in lower uterine segment and internal os. (RUNGE.)

The occurrence of bleeding from a pregnant patient demands a thorough examination. The index-finger of the aseptic hand should be carefully inserted within the external os, and, if possible, carried through the internal os. If the placenta is central, the finger will go against a pulpy mass, feeling somewhat like raw, tender meat. If the placenta be higher up, only the edge may be found, or it may not be located by such examination. If labor has begun and one or two fingers can be readily carried within the os, the diagnosis of central placenta prævia is readily made, while that of another variety is less difficult.

In diagnosticating placenta prævia it must be remembered that a granular condition of the mucous membrane of the cervix may give rise to hemorrhage which has been mistaken for bleeding from the placenta. In these cases, however, the discharge of blood is slight,

although persistent; is mixed with mucus and is readily excited by any manipulation about the cervix. A positive diagnosis can be made by examining the os and cervix with a speculum, when the condition of the cervical mucous membrane becomes apparent.

The treatment of placenta prævia demands the closest attention and the best skill of the physician. In central placenta prævia the patient is never safe until the uterus is emptied. The life of the child is lost in the great majority of cases of central placenta prævia, and the mother's life is in imminent danger. Unless strict surgical antisepsis be observed septic infection may readily occur. In cases of central placenta prævia no delay should be practised as soon as the diagnosis is established. Labor is to be induced and the uterus emptied as promptly as possible. This procedure will demand the personal attention of the physician from beginning to end, as each step of the process is fraught with its own danger.

To manage these cases successfully the operator requires a uterine dilator, antiseptic gauze, uterine dressing-forceps, obstetric forceps, scissors, probe-pointed bistoury, and in some cases instruments required for abdominal section. Elastic dilators are especially valuable in these cases. The bladder and rectum having been emptied and the vagina made aseptic, if no dilatation is present, the uterus must be dilated sufficiently to admit the finger. When the finger can enter a strip of antiseptic gauze should be thoroughly packed in the cervix and through the internal os, and also about the cervix at the upper end of the vagina. As this packing must be very thoroughly done, it is better to use partial anæsthesia to perform it properly. The entire vagina should be packed tightly enough to make firm pressure against the os and cervix. An occlusion dressing must be applied over the vulva and kept in place by a bandage. It is also essential that the uterus contracts firmly, thus making a pressure against the placenta from within. To preserve a tonic condition of the uterine muscle quinine may be given or fluid extract of ergot, ten drops every hour. Uterine contractions will usually follow tamponing and giving of ergot. The vulvar dressing should be inspected every hour, and when blood makes its appearance upon this dressing it is time to interfere and to renew the tampon.

In renewing the tampon the operator must remember that the ultimate purpose of his interference is to empty the uterus. The process of dilatation should be carried only so far as will permit the introduction of the hand and the extraction of the child. When the gauze is removed from the vagina the operator must be prepared to renew the tampon instantly or to introduce the hand, perforate the placenta, perform version, and deliver. If, when the gauze is removed, it is found that the hand cannot be introduced, a Barnes's bag may be selected or gauze may again be used. Of the two, the more reliable is the gauze, as it fits perfectly, is not readily dislodged, and favors the formation of a blood-clot upon its surface. Under careful antiseptic precaution the tampon may again be removed and the vulvar dressing reapplied. If the patient be carefully watched and the packing be done efficiently, no dangerous amount of blood will be lost, and

PLATE XI.

Placenta Prævia. Version. Death before Delivery. (STRATZ.)

CR. Contraction-ring. *oi.* Os internum. *oe.* Os externum.

sooner or later the physician will be able to introduce the hand, rupture the membranes, make version, and deliver.

In cases of placenta prævia in which the head is presenting, if, when the placenta is torn through by the physician, the head immediately descends and engages closely in the pelvis, delivery should be promptly effected by forceps. The effort to push back the child in such a case and to perform podalic version would cause increased hemorrhage, with the risk of injuring the uterus. As soon as the child is drawn into the pelvic canal by forceps severe hemorrhage must cease, and the greatest danger to the mother is past. In these cases it is occasionally possible to save the life of the child.

In cases of central placenta prævia the lives of mother and child are in the greatest danger, and delivery should be practised without regard to the child, but with reference to rescuing the mother from her condition of danger.

Although direct surgical interference seems impossible in central placenta prævia, a case is on record in which Cæsarean section was successfully practised for this condition. No complication of labor demands more prompt, skilful treatment than does this, and should the mother escape danger from bleeding she will still be threatened with septic infection.

In the other varieties of placenta prævia it is usually possible to bring down the presenting part or one end of the fœtal ovoid, and by this compress the placenta against the wall of the pelvis and check hemorrhage. (Plate XI.) In cases of partial placenta prævia, where the os and cervix will admit two fingers, version may be made by the procedure of Braxton Hicks. This consists in introducing two fingers of one hand within the cervix and pressing up the head, while the other hand raises the body of the fœtus and head and endeavors to push the trunk downward into the brim of the pelvis. By the combined use of the hands it is possible to turn the child without the introduction of the hand within the uterus.

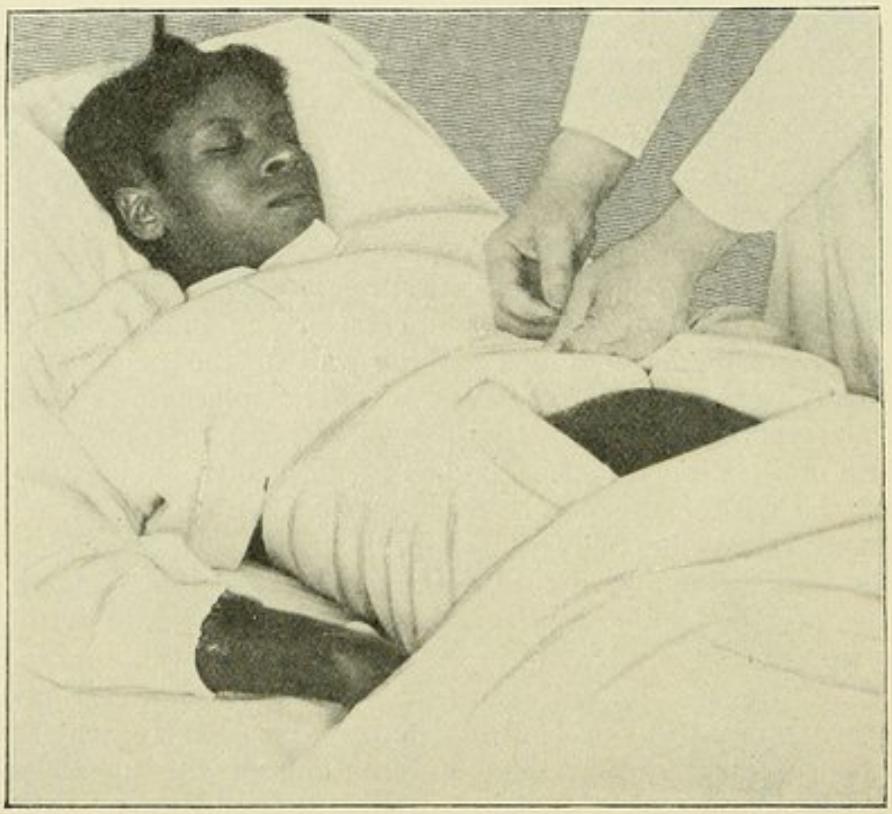
In performing version with bimanual manipulation anæsthesia, while not always necessary, should be promptly resorted to whenever the mother is so sensitive that the manipulations of the physician cause voluntary efforts which threaten to defeat his purpose. Chloroform will be found most useful, although, if delivery with forceps is anticipated, ether may be used, the anæsthesia being continued until delivery is accomplished.

In marginal and lateral placenta prævia it is usually sufficient to rupture the membranes, thereby favoring the descent of the presenting part, which will compress the placenta. The placenta should be removed as soon as the birth of the child has occurred in these cases, because its presence in the lower portion of the uterus may interfere with uterine contraction. As a rule, however, it follows the child as soon as birth occurs. In cases in which the head is presenting, but does not descend promptly after the rupture of the membranes, it should be brought into the pelvis by suprapubic manipulation and labor terminated by the use of the forceps.

The after-treatment of cases of placenta prævia requires the vigorous

use of those agencies which promote rapid formation of blood. The patient must be fed small quantities of easily digested food at short intervals. Especially valuable to patients in this condition are milk peptonized, without greatly heating it, which is much more palatable than when the same preparation is made with the prolonged use of heat; peptonized oysters, freshly made chicken-broth, beef-juice, white of egg and sherry; milk-toast with cream and sprinkled with salt; milk prepared with rennet, and raw eggs beaten up with whiskey or brandy. Milk should not be given unless peptonized, as with many weak patients it is not well digested and accumulates in the stomach, forming a mass of curd which ultimately brings about vomiting and prostration.

FIG. 127.



Application of the box binder to prevent relaxation of the uterus.

Transfusion may be practised with advantage for several days in desperate cases, while the inhalation of oxygen is also of value. Iron and arsenic are useful and small quantities of alcoholic stimulants are required. As soon as possible massage should be employed, and will be of greatest value. Such a patient must retain a recumbent position until she is thoroughly well, because of the danger of collapse and fatal syncope following heart-clot upon sudden exertion. To prevent uterine relaxation and bleeding, after hemorrhage has ceased, the uterus may be compressed by applying three rolls of towels, one above the fundus, one on each side, kept in place by a binder (see Fig. 127).

In giving a patient who has recovered from labor complicated with placenta prævia tonic remedies, care must be exercised to make a

proper choice. Some forms of iron do not agree with these cases, and the mistake is often made of giving too large doses, so that the patient's power of assimilation is overtaxed. If the patient can take it, tincture of the chloride of iron, in doses not exceeding ten drops very well diluted, may be taken three or four times daily. The tartrate of iron and potassium may be used to advantage in capsules in the following combination :

Tartrate of iron and potassium	grs. 60.
Extract of nux vomica	grs. 3.
Scale pepsin	grs. 30.

In 30 capsules, one four times daily, with food.

Other preparations of iron which are useful are the citrate of iron and manganese, the peptomanganate of iron, and, in some cases, reduced iron. In using arsenic in these patients the simplest form of administration is unquestionably the best. Fowler's solution, well diluted, taken just before or after eating, gives best results. If the patient prefers the use of some of the mineral waters containing arsenic, there are a few which are suitable, although they are not readily obtainable in this country. The property possessed by bichloride of mercury to stimulate the formation of blood-corpuscles should be remembered in some patients who recover slowly after bleeding. Bichloride in doses of $\frac{1}{200}$ of a grain may be given two or three times daily at the time when food is taken. It is questionable whether the inhalation of oxygen results in the absorption of the gas itself or whether it brings about rapid breathing and thus introduces more of the external air than the patient would otherwise take. Some cases are benefited by it, whatever may be the explanation of its method of producing a result.

In general, it may be stated that the success of treatment in placenta prævia depends upon early diagnosis, prompt and efficient manipulation, and thorough antiseptic precaution. Under the use of the antiseptic tampon the dangers of this complication have been overcome and largely reduced. Infant mortality must remain high from this cause, but is greatly lessened by prompt delivery.

CHAPTER IV.

ECLAMPSIA.

By the term eclampsia are understood convulsions, epileptiform in character, occurring during pregnancy or labor, caused by retained toxins. Eclamptic convulsions are to be distinguished from other convulsive seizures which may occur in pregnant patients. Thus, a woman going into labor may have epileptic fits. In these cases, however, a previous history of epilepsy can usually be obtained. The paroxysms diminish and finally cease, while the examination of the urine

and the amount secreted distinguish this condition from eclampsia. Hysterical attacks may simulate eclampsia, but the deceit becomes evident if the patient be closely watched. Attacks of mania or hystero-epilepsy are readily distinguished from eclampsia.

Eclamptic seizure is preceded by a condition of irritability or heaviness, which has been described in treating of the toxæmia of pregnancy. Frontal headache, disordered vision, diminished secretion of urine, and prostration may pass into a condition of partial unconsciousness, in which a patient may be entirely oblivious of what is passing about her. Thus, a woman has been admitted to a hospital, transferred to the maternity ward, seized with eclampsia, and delivered, only to become conscious of what had happened several days after the birth of her child. Her last remembrance was of her own home and surroundings. If patients have been carefully watched, it will be seen that diminished excretion precedes eclampsia. With private patients, however, it is often impossible to make this observation, because close watch cannot be kept over the patient. In some cases no appreciable symptom precedes the outbreak. The patient may become suddenly seized with mania or become rapidly unconscious and pass into convulsions.

Eclamptic fits usually begin with a fixed expression of the eyes, the head being turned to one side, often to the right. Beginning with the head and arms, the muscular system is thrown into a condition of spasms. The tongue may be caught between the teeth and severely bitten. Respiration is interfered with, the face becomes dark in color, and partial asphyxia develops, while froth issues from the mouth and nostrils. This condition is succeeded by clonic spasms in which all the muscles are thrown into violent contractions. These gradually cease and are followed in some cases by an interval of consciousness, while in extreme cases the patient does not rally between the attacks. The paroxysms are repeated at varying intervals. They may often be excited by moving the body of the patient and sometimes by any manipulation about the genital organs. As the paroxysms return, the cardiac and respiratory centres are weakened, the pulse becomes rapid, irregular, and feeble. Congestion of the lungs with œdema follows. The brain is in some cases anæmic and in others congested, with effusion of serum into the ventricles. The heart-muscle shows cloudy swelling, and death ultimately occurs in heart-failure and respiratory failure. In favorable cases labor is set up by the convulsions. Rapid delivery occurs, followed by cessation of the convulsions and the re-establishment of secretion. Eclamptic seizures occasionally return after labor, but usually diminish. In rare cases they do not begin until labor is ended.

The prognosis of eclampsia is based upon the powers of resistance which the patient's nervous system exhibits. As long as the pulse does not increase in rapidity and the temperature remains but slightly elevated, the case is not hopeless; but when the heart's action becomes progressively more rapid and feeble, the temperature rises and the respiratory centre fails, while labor is not terminated, the prognosis is of the gravest character.

The outlook for the child in these cases is unfavorable, because the same poison which caused the mother's convulsions affects also the child. The child's chances are better the more promptly labor is terminated, as it may perish from asphyxia during prolonged labor.

Eclampsia is most often seen in those patients in whom one may naturally expect failure of excretion. Women of known gouty tendency are deficient in the action of the kidneys, skin, and bowels, and are good subjects for eclampsia should they become pregnant. Primigravidæ above the age of thirty are also more liable to eclampsia than are younger women. Multigravidæ whose powers of excretion have been repeatedly taxed by previous pregnancy are exposed to danger of eclampsia. Women in poor circumstances who are overworked, poorly fed, and exposed to dampness and cold are often seized with eclamptic convulsions.

The treatment of eclampsia should be largely preventive, and this complication will grow less common in proportion as the excretions of the pregnant patient are carefully watched during the period of gestation. In the presence, however, of eclamptic convulsions, the physician's duty lies in two directions: First, to promote vigorous elimination; and, second, promptly to empty the uterus. The former is to be accomplished by the use of hot packs, the administration of purgatives, the injection by transfusion of normal saline solution, and the use of chloroform to control convulsive seizures and prevent asphyxia. To give a hot pack in these cases a rubber sheet should be laid upon a bed and covered with a blanket. Two or three additional blankets are required, which should be wrung out of as hot water as the hand can bear. The patient should be laid upon a hot, wet blanket, devoid of her clothing, and the blanket wrapped tightly about her from her neck to her feet. Additional hot, wet blankets should also be wrapped about her. She may then be covered by a second rubber sheet or several dry blankets. A cloth wrung out of cold water is to be placed upon the forehead. Convulsions can be controlled by chloroform, so that the patient can be kept tightly wrapped in the hot pack.

In using chloroform to control eclampsia close observation is required. If an eclamptic patient be watched, it will be seen that her convulsions tend to recur at almost regular intervals; and if this interval be noted, the inhalation of chloroform can be begun just before the convulsion becomes manifest. In this way a complete convulsion can be prevented and the patient saved the exhaustion which the violent muscular action induces. To prevent injury to the tongue during the convulsions a napkin should be folded and placed beneath the teeth at the angle of the jaw. This is better than a firmer object, as the injury to the teeth and gums is less. If chloroform be given upon the slightest evidence of approaching convulsion, it is usually possible to control the fits sufficiently to enable proper treatment to be carried out.

To purge a patient, one drop of croton oil may be placed in a teaspoonful of sweet oil and the whole given, as far back as possible in the pharynx. If the patient can swallow, ten grains of calomel and twenty grains of bicarbonate of sodium should be given. As soon as the patient has begun to perspire examination should be made without removing

the blankets, and the condition of the uterus be ascertained. If labor is in progress, and the os is dilating and the patient responds well to treatment, a delay may be made to secure sufficient dilatation to permit the use of forceps or version. If, however, dilatation is not present, the mouth of the womb must be opened by surgical procedures and delivery accomplished.

When the bowel has been emptied, rectal injections of warm milk, two ounces, warm water, two ounces, and chloral, grains thirty, may be given every hour until delivery can be accomplished.

Two methods of rapid delivery are in use in these cases: One consists in dilating the mouth of the womb by the fingers, elastic bags, and other means, and accomplishing delivery by forceps or version; the other and more recent method of treatment is accomplished by introducing a pair of blunt-pointed scissors, bent upon an angle, within the cervix and dividing the cervix into four flaps by four incisions at right-angles to each other. If the incisions are carried entirely through the cervix and within the internal os, there will be no tear of the womb and no considerable bleeding. Delivery can usually be accomplished by this method in ten or fifteen minutes after the procedure has actually begun. Experience shows that it is not necessary to unite the cut edges of the cervical flaps, as the tissues unite spontaneously.

Cæsarean section is occasionally practised to secure rapid delivery in eclampsia. If the patient is where adequate surgical aid is at hand, Cæsarean section offers a fair prospect of recovery for mother and child, if performed at the very beginning of the eclamptic paroxysm. If delay is practised, the chances for the recovery of mother and child are very poor.

Some have reported good results from promptly narcotizing the patient with opium, giving morphine in doses of one-third of a grain until the physiological effect of opium is produced. Some rely upon veratrum viride, which reduces the pulse-rate and lessens eclamptic paroxysms.

Tincture of veratrum viride of the United States Pharmacopœia may be given in a dose of fifteen minims by hypodermatic injection, repeated in an hour if necessary. If the dose is to be given by the mouth, from twenty to thirty drops should be administered. Care must be taken to watch the effect of this powerful drug upon the circulation, and should evidence of cardiac depression ensue, appropriate heart-tonics should be used.

Some have preferred to use pilocarpin to induce perspiration, instead of the hot pack. This drug, however, is sometimes depressing and is inferior in value to the pack.

The treatment of eclampsia by bleeding has long been the subject of discussion. There can be no question that in certain cases of asphyxia in any disease where the action of the heart is labored and heavy, the ventricles being engorged, that bloodletting is beneficial. In cases of eclampsia in which the face is livid, the pulse heavy, strong, and full, the breathing stertorous, and the aspect of the case apoplectic, bleeding is of value. It can scarcely be believed that bloodletting

benefits in these cases by withdrawing poison from the patient's body, as has been urged by some.

One attack of eclampsia predisposes to the same affection in subsequent pregnancies if the excretory organs are at fault. This is especially true in frail women, poorly nourished, and who excrete badly habitually. In such a patient the advice should be given to avoid pregnancy, and it should be understood that this advice is positive. Like other medical advice, however, it is rarely followed.

The patient who suffers from eclampsia may pass into a condition of nephritis and perish from this cause. The treatment of a person recovering from eclampsia consists in the use of such food as is suitable to nephritic patients and those excreting badly. A diet composed largely of milk, the use of an abundance of drinking-water, proper regularity of the bowels, and all the care which cases of nephritis demand should be given to these patients. As they are always anæmic after recovery, they may be given arsenic or iron to advantage. Many of them fail in lactation, and in those who endeavor to nurse a child the milk is often deficient.

As regards the prognosis of eclampsia, if the immediate indications for treatment are kept clearly in mind and prompt action is taken in these directions, the mortality-rate for mothers has been reduced to 25 or 15 per cent. If, however, cases are seen late, and if prompt treatment is not instituted and vigorously pushed, the mortality will vary from 50 to 75 per cent. The mortality for children whose mothers suffer from eclampsia will depend largely upon the promptness with which delivery is effected. If the placenta be examined in a case of eclampsia, it is usual to find areas of white infarction which diminish the respiratory area of the placenta and may destroy the fœtus by asphyxia. In all cases where the fœtus is living when the patient is seen further effort should be made to secure prompt delivery in the interests of the child.

The fœtus may also suffer from eclampsia before and after birth. If the attack is severe, especially if the convulsions recur after birth, the child will usually be lost. The treatment of eclampsia in the newborn infant consists of immersion in a hot bath and free irrigation of the intestines. Chloral may be given in minute doses.

In cases of eclampsia where death occurs before the physician has had an opportunity to deliver the child through the vagina, if the child's heart-beats are good, it is his duty to extract the fœtus by Cæsarean section. This is a simple and rapid form of delivery, and there is nothing in the operation itself which militates against the life of the child. Children, however, born of mothers suffering from eclampsia have been themselves poisoned with the toxins which caused the maternal death. Those who perform delivery in this way may have the same experience which the writer had: A strong, healthy boy, weighing eight pounds, was delivered by abdominal incision in less than five minutes after the death of his mother, who perished from eclampsia. The child was given every advantage, having a wetnurse and skilled care. He perished, however, two weeks after birth, from toxæmia, undoubtedly the result of the mother's

condition before his birth. His only relief came from treatment addressed to securing copious elimination, which for a time improved his symptoms. This fact, however, should not forbid the practice of abdominal incision in these cases. In some instances the child will survive, and all children must be lost, if, after after the death of the mother, they are not promptly extracted. In cases where dilatation of the birth-canal is complete and the fœtus is upon the pelvic floor it may be a quicker method to extract the child with forceps.

CHAPTER V.

SUDDEN DEATH DURING LABOR.

THE parturient patient may die suddenly from shock from one of several causes—rupture of the uterus, bursting of engorged veins in the pelvis, rupture of a cystic tumor obstructing labor, and sudden cerebral hemorrhage may speedily cause death. Heart-failure has been observed in patients greatly debilitated and dying suddenly. Profound mental emotion has also caused death in women in labor who have suddenly been greatly frightened or have had recent, shocking news. Sudden anæmia of the brain has been observed to cause death in cases in which hemorrhage had weakened the patient and where the patient suddenly assumed the upright position. The freedom of women in labor from death during anæsthesia has been remarkable. No authentic and thoroughly studied case is reported in which the death of the patient can be directly ascribed to anæsthesia.

One of the most frequent causes of sudden death during or immediately after labor is heart-clot. The predisposing causes of this complication are hemorrhage or any profoundly depressing circumstances. The symptoms are sudden anguish referred to the heart, with threatened asphyxia and rapidly failing circulation; the pulse on one or both sides becomes scarcely perceptible; the countenance is pallid, while cold perspiration breaks out upon the face and the patient's expression is one of great suffering and terror.

It is possible in some cases to save life by the most prompt and vigorous stimulation. Ether is usually the most convenient and prompt stimulant which can be given. It must be administered by hypodermatic injections over the heart, and repeated until the effect is noticed. Strychnine and digitalis are indicated, but are slower in action. If an electric battery is available, the interrupted current should be passed from the base of the brain to the region over the heart. The limbs should be rubbed vigorously from below upward and external heat applied liberally. Ammonia has been advised as tending to dissolve the forming clot. Whether it acts in this way or not is not definitely

known, but its stimulating properties are of value. Counter-irritation is also of service.

While these cases demand the most prompt and vigorous treatment, the prognosis is most grave. The majority of cases prove rapidly fatal.

The possibility of this complication should lead the physician to forbid his patient to sit up suddenly in bed or to be moved suddenly from one position to another. Most cases of this complication have followed a sudden change in the patient's posture.

Although the mother may perish suddenly during labor, her child may survive her for a few moments. The physician's duty in this event is an interesting question. He must at once deliver the child through the vagina if possible. If not, however, the abdomen must be immediately opened, the uterus incised, and delivery effected. If great promptness be exercised, the life of the child may be saved.

Sudden death during labor may accompany or immediately follow **rupture of the uterus.** This accident is to be feared in all cases in which a serious obstacle to delivery is present, either in the form of contraction of the pelvis or of a malposition of the fœtus which renders the normal mechanism of labor impossible. The symptoms of threatened uterine rupture are cessation in the progress of labor, tenseness of the uterine muscle, with the gradual rising in the abdomen of the strongly marked lower edge of the upper uterine segment, known as the contraction-ring. This does not become evident in normal labor, and is only present when, from long-continued efforts at parturition, the upper contractile portion of the uterus is thrown into tetanic spasm, while the lower uterine segment is excessively distended over the presenting part. The patient's labor-pains, which have been severe, grow much weaker and less frequent. Her pulse rises considerably above 100, while her temperature is two or three degrees higher than normal. Her expression is that of irritable fatigue, and her complaint of suffering is almost constant.

Unless this condition be relieved the uterus will tear, usually across its anterior aspect at the juncture of the lower and upper segments. Sometimes the continued bruising of the uterus against the promontory of the sacrum will bring about laceration upon the posterior aspect of the womb. The symptoms of this accident are sudden cessation of labor-pains, with symptoms of surgical shock. In some cases actual suffering seems to cease, and the patient is relieved from her distress. In others the complaint of abdominal pain is very urgent. The presenting part may recede from its position and fail entirely to advance. Slight hemorrhage may be present, or none may be noticed.

If such a case be left without treatment, the death of the patient must inevitably follow. Delivery is impossible by spontaneous efforts, the dead fœtus undergoes rapid decomposition, abdominal infection and peritonitis follow, with a rapidly fatal termination. The conditions are favorable for the recovery of the patient in proportion to the extent of the laceration, to the amount of the fœtal body which has escaped into the abdomen, and also in proportion to the promptness and intelligence displayed in treatment.

The first effort of the obstetrician should be, if possible, to remove

the fœtus with the least injury to the uterus. In favorable cases the head does not completely escape through the rent in the womb. The shoulder and elbow may have entered the abdominal cavity, the remainder of the fœtal body being still within the uterus. In such a case the head should be cautiously brought upon the pelvic floor, if possible, by manipulation, and the child delivered with forceps. In other cases the head and arms of the child may be within the abdomen, and the physician may find upon introducing his hand that the conditions are favorable for version. Under complete anæsthesia with ether or with chloroform he may cautiously extract the fœtus by the breech and foot, completely emptying the uterus. In rare cases the placenta is separated from the wall of the womb and expelled into the abdominal cavity. Where this is present the fœtus rapidly perishes from asphyxia.

If the obstetrician can deliver the fœtus through the vagina with no additional injury to the uterus, he should make a thorough examination to determine the situation and extent of the rupture. If the uterus has been completely emptied, he may find it so tightly contracted that the laceration has been reduced to a small rent, the body of the womb remaining in good position. In these cases abdominal incision should not be practised, but the uterus should be tamponed with antiseptic gauze, the end of the gauze being carried through the rent and into the abdominal cavity. The purpose of this tampon is to provide drainage, to prevent further hemorrhage, and to seal up the abdominal cavity from septic material which might otherwise enter through the rent in the uterus. The patient's intestines should be thoroughly emptied, she should be fed small quantities of easily digested food, and be closely watched. In favorable cases serious infection does not occur, the patient's temperature does not rise above 101° or 102° F., the lochial discharge is not offensive, and the patient makes a gradual recovery. The gauze should be removed in forty-eight hours and the vagina carefully swabbed with antiseptic solution, the cavity of the uterus cleansed in the same manner, and the gauze packing replaced. Care should be taken to exercise no violence in reinserting that portion of the gauze which enters the pelvic cavity. An occlusion dressing must be worn over the vulva and the external parts be kept scrupulously antiseptic and thoroughly protected. Douches should be avoided in these cases, lest the fluid employed enter the pelvic cavity through the rent in the uterus, carrying septic material or setting up an irritation.

In cases, however, where a considerable part of the fœtal body escapes into the abdominal cavity no attempts should be made to deliver the child through the vagina, but the abdomen should be opened as soon as possible. The form of operation to be selected is that of hysterectomy, amputating the uterus at the junction of the lower and upper uterine segments, removing tubes and ovaries, and closing the stump by suture. If a considerable amount of blood or amniotic liquid is found in the pelvis, it should be carefully removed with aseptic gauze or sponges and a glass drain employed for twenty-four or forty-eight hours. The child is to be extracted as best can be done when the extent and nature of the rents in the uterus are ascertained after the abdomen is

opened. The effort to save the uterus by extracting the child and closing the opening with suture is attended with so much risk that the safer operation is in hysterectomy. The results obtained by abdominal section in these cases depend upon the length of time which the woman had been in labor and upon the presence or absence of infection. So many of these patients are repeatedly examined during labor by infected persons, and so many of them have been in labor so long and subjected to such frequent manipulation before rupture occurs, that the interior of the womb, the amniotic liquid, and sometimes the fœtus, have all become infected before the abdomen is opened. In other cases considerable hemorrhage into the abdominal cavity has occurred. In others infection from the intestinal tract may subsequently develop, complicating the result of the operation. So many of these factors in the problem are beyond the control of the operator that the result of the operation is always a doubtful one. When, however, the conditions are favorable in the absence of infection, of severe hemorrhage, and of profound shock, patients are saved. The effort should always be made by prompt operation.

Sudden death in labor may accompany or result from inversion of the uterus. The causes leading to this accident are rapid, uncontrolled delivery with the patient in the erect or semi-erect posture, pulling upon the umbilical cord in delivering the placenta, and excessive straining and bearing down on the part of the patient during labor. The symptoms of inversion of the uterus are sudden shock, hemorrhage, and the appearance of the inverted womb protruding from the vulva. The uterus may not be recognized at once if the placenta is attached to it, or it may be mistaken for a fibroid polyp which has followed the child in the emptying of the womb.

The prevention of this accident is to be brought about by controlling the labor of the patient, preventing her from excessive straining and bearing down, putting her in a suitable posture, and, if necessary, employing an anæsthetic to modify the contractions of the uterus. Methods of delivering the placenta which rely largely upon traction upon the umbilical cord are necessarily dangerous, and should not be practised. In delivering the placenta by Credé's method care must be exercised that, in pressing upon the uterus, the fundus of the uterus is not indented by efforts at delivery of the placenta. The uterus should be grasped between the fingers and the ball of the thumb and the strong portion of the hand which is developed where the thumb joins the wrist. Pressure upon the womb should be exerted from before backward, and not from above downward. In this way the anterior and posterior walls of the uterus are brought forcibly together and the placenta is squeezed out of the uterus without indenting its wall at the fundus.

This accident having occurred, the first and primary indication is to replace the uterus immediately. The patient should be promptly brought to the edge of the bed or table, her thighs supported by assistants or her feet placed in chairs. If the placenta is still adherent to the uterus, it should be completely removed and the uterus and the surrounding tissues thoroughly douched with hot bichloride solution,

1 : 5000. If the attempt to replace the uterus causes suffering, an anæsthetic should be employed.

In attempting to put back the womb two things must be done: First, the fundus of the uterus must be indented and carried backward and then upward; second, the contraction-ring which prevents the replacing of the uterus must be dilated at the same time that the uterus is returned to its normal position. This manipulation is best accomplished by covering the inverted fundus with several layers of antiseptic gauze to prevent injury to the endometrium. The operator then places his thumbs at the lowest point of the inverted fundus and indents, by steady and strong pressure, this portion of the uterus. With his fingers and thumbs he makes outward pressure at the same time, while with his hands he carries the uterus backward into the vagina and upward toward the brim of the pelvis. The first sign of success will be the gradual yielding of the uterine wall and its indentation. This will go on slowly until, possibly, the knuckles of the hand can be brought to press against the womb, when its restoration may follow quickly, with a sudden reverse contraction of the uterine muscle. In performing this manipulation strength and gentleness are both requisite. No sudden motion should be made, as this but irritates the uterine muscle to spasmodic contraction. Gentle, steady pressure, properly applied, will in nearly all cases overcome the difficulty. When the uterus has been replaced, it should be again douched with hot bichloride solution, and symptoms of shock, which are usually present in these cases, will require additional attention.

Post-partum bleeding occasionally follows the replacement of the uterus, and must be met by the treatment appropriate to that condition. The danger of septic infection from this accident is considerable. The site of the placenta is exposed to direct contact with the hands of the operator and with other portions of the patient's body. If her surroundings are not clean, the opportunity for infection is thus abundant. Should rise of temperature follow the replacement of the uterus the womb should be thoroughly douched with antiseptic solution.

It is sometimes impossible to replace the uterus immediately, and the services of the obstetrician may be required in consultation in a case in which the original accident happened days or weeks before he sees the patient. In these cases, if septic infection is present, the patient's best chance for life and recovery will lie in extirpating the uterus through the vagina. Clamps or ligatures may be used, and the operation is not in these cases an especially difficult one. If, however, septic infection is not present, the uterus is to be replaced by essentially the same method which would be employed were the accident a recent one. As long-continued pressure is required in these cases, manipulation without the aid of apparatus can rarely be employed. Some form of instrument making pressure against the fundus in as harmless a manner as possible must be used. Several of these have been employed successfully. Under strict antiseptic precautions, and with interruptions in the use of the apparatus, to prevent necrosis of the tissues, the womb is usually replaced in from twenty-four to thirty-six hours. The

apparatus is to be applied and remain in position for six or eight hours, followed by an intermission of four to six hours.

It is often possible for two physicians to treat one of these cases successfully by making pressure and relieving each other at intervals for a period of several hours. When the pressure is not being made a firm tampon of antiseptic gauze should be placed upon the inverted fundus and the uterus carried up as far as possible by a T-bandage. If any impression at all can be made upon the fundus, continuous pressure by a firm tampon will sometimes result in the spontaneous reversion of the uterus. This method has for its advantages the fact that the pressure is constantly under the observation of the operator while active efforts are being made, while the antiseptic tampon is a less injurious material to apply for a long time than is any form of apparatus. The hope of replacing the inverted uterus should not be abandoned until long-continued pressure at intervals, with dilatation of the constricting-ring, has absolutely failed to produce the slightest effect.

Sudden death may follow labor by reason of sudden **intra-abdominal bleeding**. Such may follow rupture of dilated veins in the broad ligaments, the rupture of an ectopic pregnancy occurring coincidently with intrauterine pregnancy, the bursting of an aneurism, or sudden pulmonary hemorrhage in a patient advanced in phthisis. The symptoms of intra-abdominal hemorrhage are severe surgical shock, gradual cessation of labor-pains, while usually the presence of a mass of blood in the pelvic cavity can be diagnosticated by vaginal examination. This condition is one sometimes difficult to diagnosticate, and requiring immediate treatment. But one method of treatment can offer hope of success, and that is the immediate opening of the abdomen, search for the source of bleeding, and control of hemorrhage. If ruptured veins of the broad ligaments are causing the hemorrhage, they must be tied, and, if necessary, hysterectomy with removal of the tubes and ovaries be done. If ruptured ectopic pregnancy has resulted in hemorrhage, the ruptured tube must be removed with the ectopic embryo. Abdominal aneurism will naturally occasion such sudden and profuse bleeding that interference is hopeless.

In the presence of sudden and severe pulmonary hemorrhage in tuberculous patients, occurring at labor, the outlook is rarely so grave for the immediate death of the patient as the threatening symptoms would indicate. If free stimulation be employed and labor promptly terminated, it is usually possible to tide the patient over parturition. The free use of stimulants by hypodermatic injection, and ergot given freely as soon as the womb is emptied, furnish the best treatment for these cases.

CHAPTER VI.

LABOR COMPLICATED BY DISPROPORTION BETWEEN PELVIS AND FŒTUS.

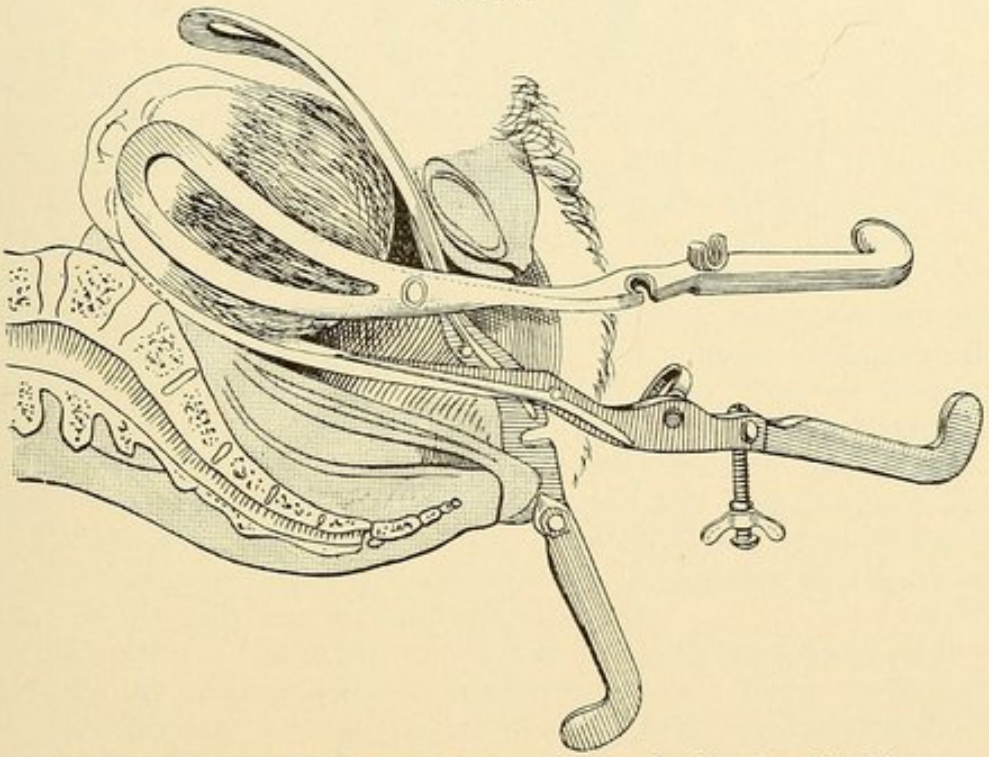
One of the most deceptive complications in labor is disproportion between the head of the child or its body and the pelvis of the mother. Measurements may show that the mother's pelvis is normal in size, and hence the obstetrician anticipates no especial difficulty in labor. If the patient has borne a child previously, there may be no history of complicated labor. If the abdominal wall be thick, palpation may give no adequate idea of the size of the head, and hence afford no warning of difficulty in labor. The usual history of such cases is that the mother has been exceedingly well during pregnancy, and that her appetite and strength have been excellent. The first stage of labor is usually prolonged and the head is still in the pelvic brim. Labor-pains gradually lose strength and vigor, the membranes rupture, but no progress is made. Mother and child show signs of exhaustion, and it is evident that assistance is required.

In order to understand the treatment of these cases it is necessary to consider the mechanism by which the head is moulded to the pelvis in normal labor. As uterine contractions force the head down, the resistance of the pelvic brim compresses the vertex, causing the sutures to come nearer together than normal and forcing cerebro-spinal fluid from the brain into the membranes of the cord. So perfect is the arrangement of the skull that a very considerable degree of pressure may be sustained in normal cases. Various measurements have been made to determine the extent to which the various diameters of the skull may be lessened by pressure during labor without positive injury to the brain. While these investigations are of great interest, they unfortunately give us no practical data by which to estimate the degree of compression to which the head is subjected. When the caput-succedaneum increases continually, the sutures override, and the head fails to advance, dangerous compression is going on. The effect of such compression is intra-cerebral hemorrhage. One of the sinuses of the brain may be ruptured or small bloodvessels may be torn within the brain, the lesion resulting in the pouring out of the blood into the brain-tissue. If such hemorrhage covers a considerable area of the brain, its results are fatal.

In some cases nature overcomes this disproportion between head and pelvis by prolonged and vigorous labor-pains, which mould the head and finally force it through the pelvis. When the head emerges after such labor it is drawn out and the occipito-mental diameter is greatly increased. As long, however, as the pressure has been equally distributed upon the head, and hemorrhage has not occurred into the brain, the child may live, although it is greatly distorted.

The treatment of cases of labor in which the head is disproportionately large requires a very careful estimate of the possibility of delivery by the natural passage. Errors are usually made in diagnosticating the presence or absence of engagement of the head. Physicians may find one parietal bone projecting downward and may mistake its convexity for the entire vertex of the skull. No more dangerous mistake can be made, because the presentation of the parietal bone is itself an indication that the head cannot pass normally through the pelvis. The value of partial anæsthesia in these cases is very great, as it enables the physician to make an accurate diagnosis. By putting the patient wholly or partially to sleep and introducing enough of the hand to palpate the head thoroughly, the physician can observe whether the head has really entered the brim of the pelvis or whether it has failed to engage but is rotating laterally, and a parietal bone is brought down. If the head has engaged and the indications for delivery are positive, the forceps should be applied. If, however, the head has not engaged, and suprapubic manipulation fails to bring it into the brim of the pelvis, measures must be taken to enlarge the pelvic brim.

FIG. 128.

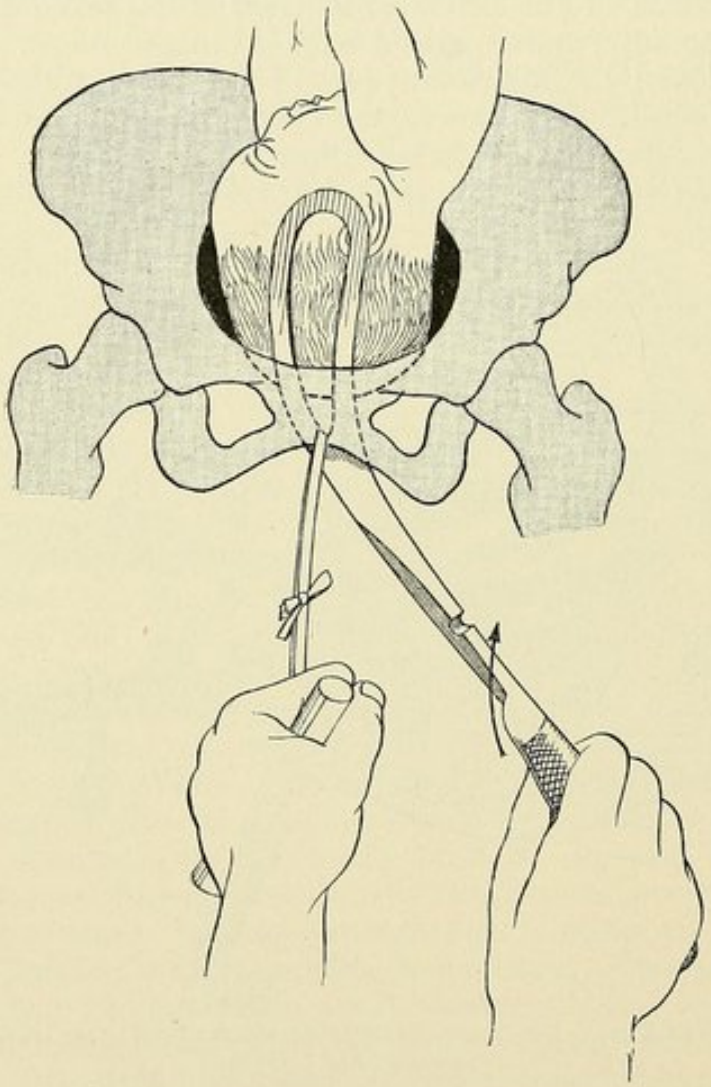


Rotating the upper right forceps blade into position; head in the pelvic brim. (FARABOEUF and VARNIER.)

In the first of these cases successful delivery can only be secured by making traction in the axis of the pelvis, hence axis-traction forceps are especially indicated. The forceps should be applied securely to the sides of the child's head, care being taken that the points of the blades do not press upon its neck or throat. Tarnier's forceps are especially adapted for delivery in these cases, and usually proves most efficient. Simpson's forceps with axis-traction tapes also give excellent results in delivery with these patients. It is an advantage in some cases to turn

the patient upon her left side, which permits better traction in the axis of the pelvis. Ether is the preferable anæsthetic, as it stimulates uterine contractions. As the child suffers from artificial delivery in these cases it is well to have means for resuscitating it at hand. Hot and cold water, stimulants, and, if possible, an electric battery should be in readiness. The operator must be prepared to perform double episiotomy, in order that the child may be readily delivered with as little danger to the mother as possible. While delivery should be effected as promptly as possible, traction should be made with the pains, and undue pressure with the forceps upon the head must be avoided.

FIG. 129.



Illustrating axis-traction at the pelvic brim. (FARABOEUF and VARNIER.)

Prognosis in these cases for the mother and child is good if the head can engage in the brim of the pelvis. Patience and accurate adjustment of the forceps are essential in the interests of the mother and child. In using Simpson's forceps it is well to relax their grasp between the tractions, thus interrupting pressure upon the head. In cases where the fœtus is larger than the pelvis, if the child presents by

the breech, it will be exposed to great danger at the moment of parturition. The passage of a large head through the pelvis in such a case causes severe pressure upon the fœtal brain, with resulting intracranial hemorrhage, while, if the delivery is difficult, the force necessary to extract the fœtus may cause fracture of the skull by bringing the head violently against the promontory of the sacrum. Pressure upon the cord during prolonged labor in such a case may readily cause fœtal death through asphyxia. The mother will be liable to laceration of the pelvic floor through the excessive size of the fœtus and the efforts which must be made to assist its delivery. Great difficulty is sometimes experienced in these cases in extracting the shoulders by reason of their large size. One or both clavicles may be fractured by such a birth. This accident, however, is not a serious one as far as the life of the child is concerned, and the fœtus usually recovers from such a fracture without noticeable deformity.

The conduct of labor where an excessively large fœtus presents in breech presentation requires careful watching. The membranes should be retained unbroken as long as possible to secure complete dilatation. Traction should be avoided upon the breech or legs of the child, lest the arms become separated from the trunk. The extraction of the shoulders must be done in the usual manner, care being taken to rotate the bisacromial diameter of the fœtal body into one of the oblique diameters of the pelvic brim. The head of the child must be followed down as the body emerges by pressure upon the uterus, that complete flexion may be preserved. When the birth of the head occurs Simpson's forceps with tapes should be ready, and if the first efforts at extraction fail the forceps should be promptly applied to the sides of the pelvis and traction made in the axis of the pelvis, while external pressure is continued behind the pubes. If delivery cannot be accomplished by these methods, the operator must perform craniotomy or open the pubic joint. The wishes of the parents must be ascertained before the actual birth occurs, so that the operator may be free to do what is required or may understand the limits which the case imposes upon him. If the child be living and in good condition, symphysiotomy offers an excellent chance, if done promptly and under antiseptic precautions, to save the lives of mother and child.

The difficulties of labor when the fœtus is disproportionately large are increased by the development of a face presentation. From the fact that in face presentations the long diameters of the fœtal head are constantly brought to present in the pelvis, the mechanism of labor is unusually prolonged, while its difficulties are greatly enhanced. As long as the chin can be brought to rotate anteriorly hope of successful delivery through the vagina should not be abandoned. It will frequently be necessary in these cases to bring the head over the pelvic floor with forceps, and, if the head be large, a severe laceration of the pelvic floor is almost inevitable. Should the fœtal head become impacted and the chin turned behind, symphysiotomy or abdominal section offers the only hope of securing a living child. Craniotomy in such a case is often more difficult and dangerous to the mother than delivery by symphysiotomy or Cæsarean operation. As soon as a diagnosis is made in such a case,

the physician should obtain a clear understanding with the husband of the patient and hold himself in readiness to interfere at any time with such operative procedure as the case may demand. The dangerous feature of such labor is the fact that unless the attending physician is skilled in diagnosis he will not recognize the abnormal size of the fœtus, and sometimes its abnormal presentation, until the patient has become partially exhausted and the child has been subjected for some time to injurious pressure. Version in face presentations where the fœtus is excessively large is a dangerous procedure, because the great size of the child renders rupture of the uterus especially likely.

When an abnormally large fœtus presents in brow or parietal presentation the case demands radical interference. Efforts to correct the presentation by bringing down the vertex or the face often fail in these cases. The use of forceps is contraindicated, and the operator has the choice of symphysiotomy or abdominal incision. Cæsarean section with suture of the uterus (cœlio-hysterotomy) will often enable the physician to extract the child with least damage and danger to mother and fœtus. Craniotomy in such a case is quite as serious a matter for the mother as is abdominal delivery if properly performed.

When an excessively large fœtus occupies a transverse position, presenting by the shoulder, version requires more than usual caution to avoid injury to the womb. Gentle manipulation is absolutely necessary, with a very gradual extraction of the hips and trunk. The difficulties already enumerated in the delivery of a large fœtus by breech presentation will be experienced in these cases.

In cases where the head does not engage in the pelvic brim one of several procedures may be tried to enlarge the pelvis. The simplest of these is that known as Walcher's position. This consists in placing the patient upon her back at the edge of a high bed or table, her hips projecting over the edge of the support on which she lies. The limbs are allowed to fall downward toward the floor in an extended position. The effect of this manœuvre is to rotate the two halves of the pelvis forward and slightly outward upon the sacro-iliac joints. In young patients in whom the tissues are elastic sufficient increase in the size of the pelvis is thus obtained to make a practical difference in the course of labor. As the tendency of the patient is to slip off from the bed, it may be necessary to support her body in this position. This may be done with the assistance of nurses, or by passing a broad, soft band, like a folded sheet, across the chest or across the back and over the shoulders beneath the axillæ. A few strong labor-pains with suprapubic pressure will cause the head partially to engage with this manipulation.

It is often of advantage in these cases to place the patient in a sitting posture upon a hollow support, like the rim of a bucket or of a large earthen jar. The thighs should be rotated outward, while the trunk of the body may be sustained by placing both hands upon a fixed object at a convenient distance. If the attendant will then sit beside the patient and pass his arms about her waist, he may make pressure upon the head above the pelvic brim with his hands, one upon each side of the head, and thus bring the head downward and backward into the pelvic brim.

In cases where manipulation fails, when aided by posture, to bring the head into the pelvic brim, the pelvis should be enlarged by operative procedure. The pubic joint may be opened or the rami of the pubes may be severed. The simpler operation, symphysiotomy, gives excellent results in a certain class of cases. Experience has shown that while the operation itself is not difficult from a surgical standpoint, yet that injuries to the birth-canal may occur during delivery, the results of which may seriously affect the patient's health and even endanger her life. In cases where the vulva and vagina are small and imperfectly developed the delivery of the head after symphysiotomy is likely to bring the tissues in the anterior vaginal wall against the cut ends of the pubic joint and produce laceration. This injury may be followed by infection, and septic poison may gain a ready access to the peritoneal cavity. In cases, therefore, where the birth-canal is poorly developed it may be necessary to perform extensive episiotomy or to select a method of delivery by abdominal section.

The physician cannot make an accurate judgment in the case unless he considers not only the physical condition present, but also the circumstances of the patient's life and surroundings. If she be a married woman in comfortable circumstances, to whom the life of offspring is valuable, and whose future good health is essential for her family, it may be better to accomplish delivery by uterine incision followed by suture of the uterus. If, on the contrary, she be unmarried and without means of support, it may be better to extract the child by abdominal incision, performing hysterectomy afterward. If the parents deliberately choose to expose the mother to no risk, but to sacrifice the child, embryotomy must be performed or the physician must retire from the case in favor of someone else. Cases are rare, however, among the well-to-do in which it is necessary to perform a radical operation.

The success which attends surgical delivery is such, however, that as soon as it is found that the head cannot engage without injuring the pelvis an operation should be promptly performed.

The mortality among children delivered in these cases will depend upon the skill and good judgment shown by the operator in charge. Symphysiotomy in proper cases will save the life of the child, while a similar result attends abdominal section in the majority of cases. The greatest cause for fœtal mortality with these patients is error in diagnosis, through which the physician in attendance allows the child to be subjected to long-continued pressure or destroys its life by fruitless efforts at delivery with forceps. If the membranes are retained unbroken as long as possible, the chance for life of the fœtus is greatly improved.

The same causes which injure the life of the child threaten the mother's recovery. The majority of women who die after labor in these cases perish, not from delivery, but from delay, which brings about exhaustion or sepsis, complicating a tardy operation. The question of the mother's life may often turn upon promptness in choosing the method of delivery and in carrying it out.

In cases where the child is excessively large, if the mother receives no assistance in labor, the fœtus dies during parturition from long-

continued pressure, the mother's strength gradually fails, the uterus passes from a condition of tetanus to the relaxation of exhaustion and septic infection, the fœtus becomes infected, while long-continued pressure upon the neck of the uterus may bring about necrosis and fistulæ. A patient may survive in such a condition for several days, ultimately perishing of exhaustion and infection. If the dead child be removed and the septic uterus cleansed or also removed, recovery occasionally follows.

CHAPTER VII.

LABOR IN LARGE PELVES (JUSTO-MAJOR).

THE course of labor may be abnormal by reason of the disproportionately large size of the mother's pelvis. While this condition rarely risks the mother's life, the child may present in an abnormal manner, and may be in considerable danger by reason of complicated labor.

The diagnosis of a pelvis larger than the child is made by pelvimetry and by palpating the child's head and pressing it downward into the pelvic brim. The child is often found abnormally movable in these cases and with no typical presentation. If considerable amniotic liquid is present, it will escape rapidly and freely when the membranes rupture, and a coil of the cord may prolapse or the fœtus may be caught in the pelvis in an abnormal position. Thus, shoulder presentations or transverse positions are observed in these cases. The face may present or the occiput may be turned behind. If the patient be a strong woman with well-developed uterine muscle, labor may be rapid and easy and terminate precipitately if she be upon her feet when the membranes rupture. The child may be expelled upon the floor and be injured in the fall, or the cord may be ruptured, or inversion of the womb and bleeding may occur.

It is well, therefore, to keep the patient in bed in these cases during labor, and to examine her promptly as soon as the membranes break, to rectify any abnormal presentation which may develop. Should a cross-birth be present version must be performed, while a malposition of the head may be corrected by the introduction of the hand and labor allowed to terminate spontaneously. If the birth-canal be well developed, the mother is seldom injured by delivery. Rapid emptying of the uterus predisposes to imperfect contraction, and hence to danger of hemorrhages. If labor has been precipitate, the physician must take especial pains to avoid postpartum bleeding.

If multiple pregnancy is present with large pelvis, impaction of the children may result, with death to one or both, unless delivery is promptly effected.

Justo-major pelves are commonly observed in women above the

ordinary stature. Such patients are not necessarily tall, but broad in the shoulders and hips. They are usually possessed of good muscular system, generally women coming from working-people and who have been accustomed to muscular exertion from childhood. They are often possessed of excellent powers of assimilation, so that the fœtus in these cases is frequently above the average size and seems to correspond to the pelvis. When this is the case the mechanism of labor is the normal one, and complications in labor do not necessarily arise. These women occasionally have excessively large children, and dystocia from disproportion may complicate birth.

CHAPTER VIII.

LABOR IN CONTRACTED PELVES—JUSTO-MINOR, RHACHITIC, FLAT.

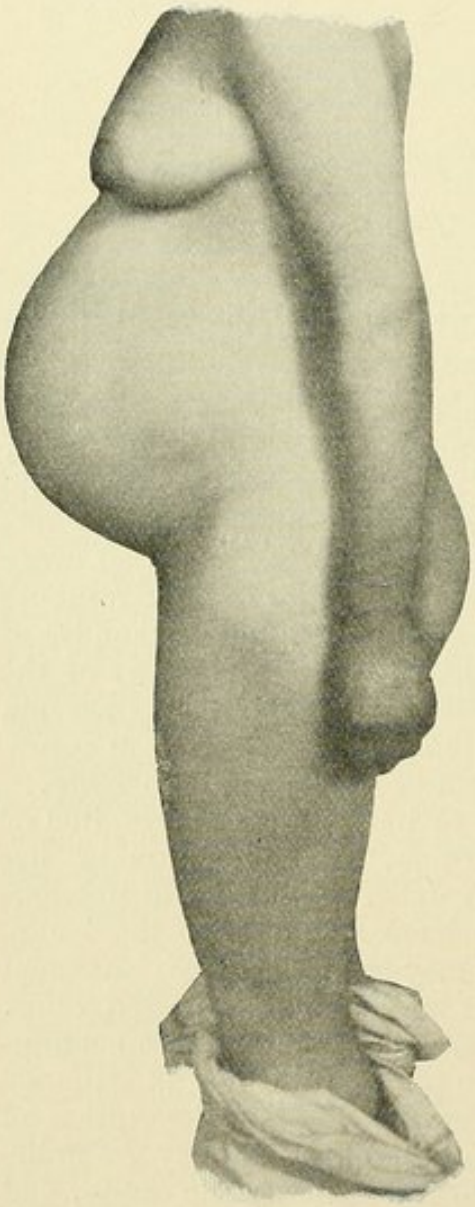
THE statement is sometimes made that contracted pelves are rare among American women. If this reference is to the American Indian, the statement may be susceptible of proof; but if the remark is meant to apply to the white and black inhabitant of the United States, it certainly is far from accurate. Observation abundantly shows that every form of contracted pelvis is imported from Europe in immigrants to this country, while the American negro shows frequent examples of contracted pelves. Among the better classes extreme deformity of the pelvis is rare, but abnormalities in the size of the bony pelvis are not uncommon. Only those who practise pelvimetry extensively can appreciate the fact that abnormal pelves are not of infrequent occurrence.

The diagnosis of contracted pelvis is to be made by observation of the patient's stature and general condition, by examination of her pelvis, and her skeleton should deformity exist. A history of previous complicated labor, of disease of the skeleton, or injury to the bones, should arouse suspicion that contraction may be present. No statement of the patient, however, or of her friends is of more than partial value. The physician must depend entirely for accurate information upon himself. While in complicated cases of rare pelvic distortion an elaborate series of measurements are necessary for the accurate description of an abnormal pelvis, for practical purposes the physician may get information regarding the size of the pelvic brim, of the pelvic cavity, and the outlet with but simple apparatus and without prolonged examination.

The brim of the pelvis may be measured and estimated by pelvimetry and by palpation. If the distance between the anterior superior spines of the ilia, between the outermost points of the crests of the ilia, between the trochanters of the femora, from the posterior superior spine of the

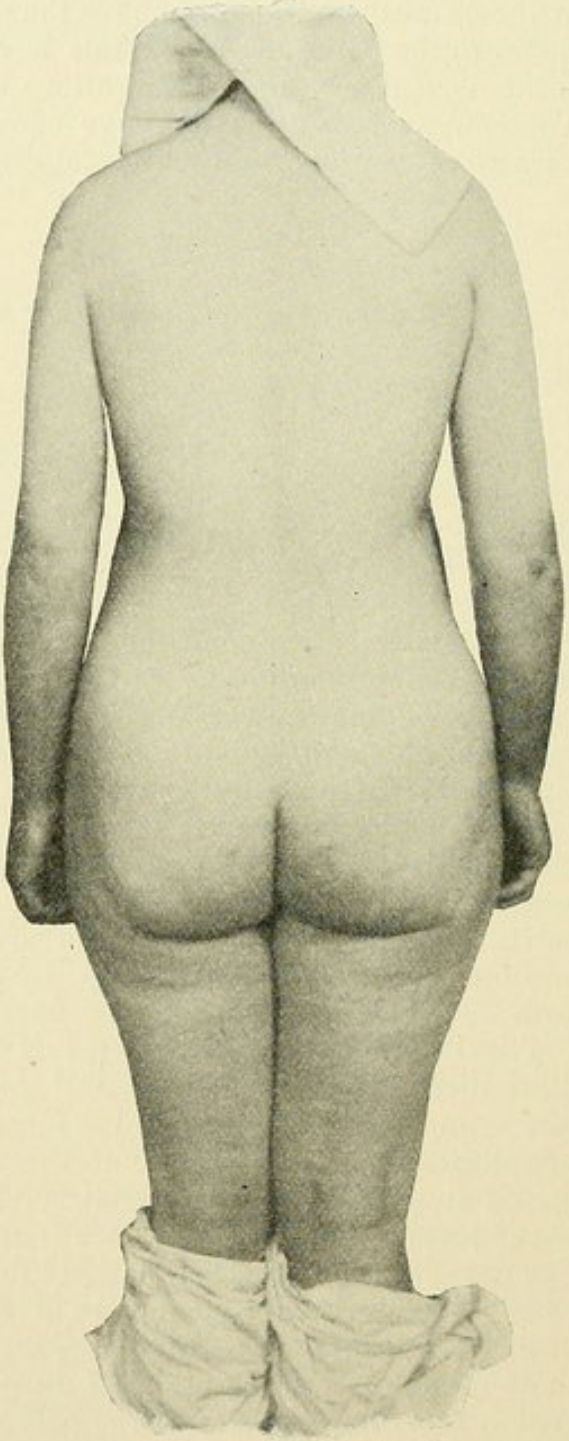
ilium on one side to the anterior superior on the other, and from beneath the spine of the last lumbar vertebra to the middle of the pubic joint in front, be taken, and these be found smaller than the average,

FIG. 130.



Attitude and contour of normal woman at full-term pregnancy.

FIG. 131.

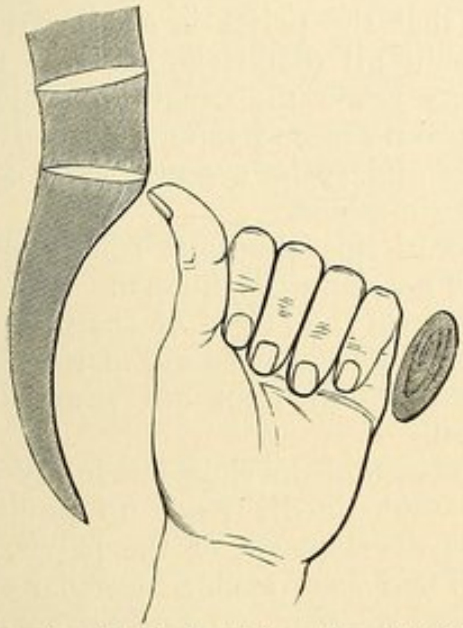


Posterior surface of body, normal woman at full term.

but proportionate to one another, the diagnosis of symmetrically contracted or justo-minor pelvis may be made. The antero-posterior diameter of the pelvic brim may also be measured by internal examination

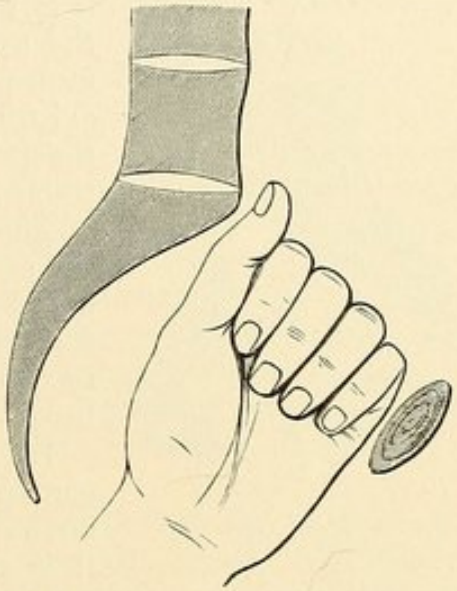
with the finger-tip upon the promontory of the sacrum and the finger of the external hand marking the distance beneath the edge of the pubic joint; to measure approximately the cavity of the pelvis the hand may

FIG. 132.



Johnson's method. Hand, from thumb to little finger, measures four inches. (HERMANN.)

FIG. 133.



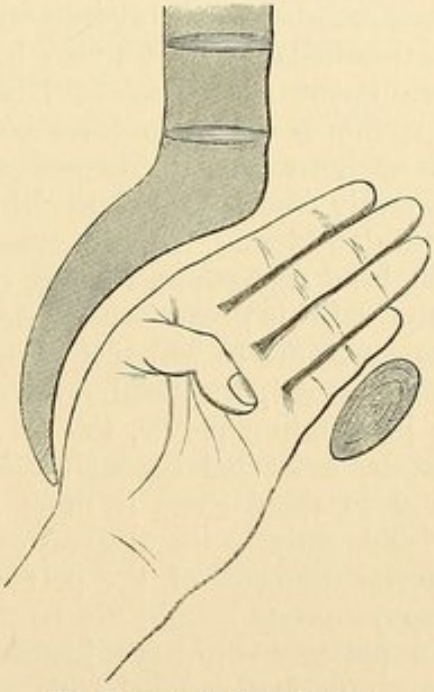
Hand measures three and one-half inches.

be introduced within the vagina, and the sides of the pelvis palpated and the distance from one side to the other estimated.

FIG. 134.

Hand measures three and a quarter inches.

FIG. 135.



Hand measures three inches.

If the hand be folded and measured across from ulnar to radial border, the physician will possess a measure which can be applied to

the pelvic cavity. The outlet of the pelvis may be examined by the fingers or by measuring with a pelvimeter between the tuberosities of the ischia. The circumference is obtained by measurement with a tape-line, the measure passing below the pelvic brim and parallel with Poupart's ligament. When by examination it is found that the pelvis is smaller than the average in all diameters, but that the measurements retain the usual proportions existing between those of the normal pelvis, the pelvis is said to be symmetrically contracted or justo-minor.

FIG. 136.

Hand measures two and a half inches.

The cause of this abnormal condition of the pelvis is not definitely known. It does not depend upon the height of the woman, for tall and slender women are more liable to this complication than are short and broad women.

Lack of muscular development in several generations undoubtedly tends to produce an imperfect development of the pelvis, as it is rare to find such among muscular and well-developed women. These cases are deceptive, for, as no deformity exists and the patient is crippled in no way, there is no reason for suspecting an abnormal condition in her pelvis.

The course of labor with such a patient will depend entirely upon the size of her child and her muscular and nervous vigor. If the child be as much below the average in size as is the mother's pelvis, no complication in labor need arise; but if the child be of average size and development, the course of labor will rarely be normal. Where disproportion is slight the head may enter the pelvis in very strong flexion and be born after prolonged and exhausting labor. The skull will be greatly compressed, and difficulty may be experienced in delivery of the shoulders. In such cases the cautious use of forceps is indicated if the head engages and passes slowly through the pelvis. The danger to the child is greater than normal, because of the long-continued and severe pressure to which it is subjected.

If, however, the head does not engage and cannot be made to do so in a justo-minor pelvis, the pelvis must either be enlarged or the child must be extracted through the abdomen. In considering symphysiotomy in these cases it must be remembered that this operation is advisable only in less degrees of pelvic contraction; thus, if the antero-posterior diameter of the pelvic brim be less than 9 cm. or $3\frac{1}{2}$ inches, symphysiotomy should not be undertaken.

In patients who have justo-minor pelves the vulva and vagina are often imperfectly developed, and hence delivery by symphysiotomy would result in serious injury during the extraction of the child.

In such cases abdominal section is to be preferred. In choosing symphysiotomy the age of the mother should always be considered.

Experience shows that in women considerably over thirty years the pelvic joints may be so firm that difficulty may be experienced in severing the pubic joint, while the partial rotation at the sacro-iliac joints which is necessary for delivery after symphysiotomy may not occur. In such women symphysiotomy does not give its most brilliant results.

The mortality-rate for mothers in cases of justo-minor pelves depends upon diagnosis of engagement of the head or the recognition of the fact that engagement is impossible. In cases where failure of engagement of the head is promptly recognized and operation is undertaken without fruitless endeavors to deliver with forceps, the prognosis for mother and child is good. In neglected cases and those in which the forceps is applied unsuccessfully and repeatedly the prognosis for mother and child is extremely bad. The prognosis for the child in these cases is influenced by the same conditions which decide that of the mother. In cases delivered by the forceps, if the blades are applied accurately to the sides of the head, and if pressure is relaxed between the tractions, the forceps will not lessen the chance of the child. If, however, the forceps is used carelessly, the large proportion of children are lost through hemorrhage occasioned by pressure.

In cases where the patient is delivered through the vagina tear of the pelvic floor and perineum very commonly occurs. The fact that the head cannot be born in the normal manner, and hence that the pelvic floor is not dilated gradually, renders laceration common in these cases. As many of these patients are ill-developed in their muscular tissues, injury to these parts is not surprising.

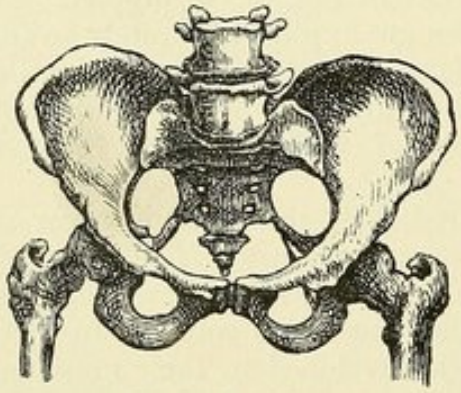
While the justo-minor or symmetrically contracted pelvis cannot be considered a deformed pelvis, the rhachitic pelvis is a common variety of deformed pelvis. It occurs in patients who suffer from rhachitis, and is not uncommon among the negro population of the United States. The causes of rhachitic pelves are those which induce rhachitis in the skeleton. Many of these patients have the disease before birth, and those who live amid poor surroundings rarely recover from it. The diagnosis of rhachitic pelvis is made by observing the signs of rhachitis in the skull and long bones of the patient, and also by examining the pelvis.

The characteristic enlargement of the cranium as contrasted with the face, the enlargement of the epiphyses, the rhachitic rosary upon the chest, and the catarrhal condition of the bronchial and intestinal mucous membrane commonly present in these cases will assist greatly in making a diagnosis.

If pelvimetry be practised, it will be found that the proportion existing between the measurements taken between the anterior superior spines and the outermost points of the crests of the ilia is destroyed. While the difference between these should be between two and three cm., there is no difference, for the relationship is reversed, the distance between the spines being greater than between the crests. In addition to this deformity the pelvis is commonly flattened, the antero-posterior diameter being considerably lessened. The results of these contractions is a pelvic cavity irregular in outline, being not only flattened, but contracted from side to side at the posterior third of each lateral half.

The course of labor in rhachitic pelves is influenced not only by the shape and size of the pelvis, but also by the muscular strength of the mother, which in highly rhachitic women is often deficient. In addition to this it must be remembered that the fœtus often shares the mother's disease, and that its enlarged rhachitic skull adds a serious complication to labor in these patients. If it be found that the antero-posterior diameter of the pelvic brim be 8 cm. or 3½ inches and the patient be at term, spontaneous labor may be allowed with the hope that the head can be extracted by forceps. If, however, the pelvis be smaller than this, and when labor occurs the head does not engage, the patient must be delivered by surgical procedure. In view of the frequency of intrauterine fœtal rhachitis caution must be exercised in selecting symphysiotomy, the danger being that the large skull of the child may seriously injure the mother in passing through the vagina and vulva. Unless these parts be well developed and readily dilatable, delivery should be accomplished by abdominal section, followed preferably by hysterectomy. If a patient with rhachitis whose antero-posterior pelvic diameter is 9 cm. be seen early in pregnancy, labor may be induced at the eighth month with the expectation of securing delivery through the vagina. In rhachitic pelves with smaller antero-posterior diameter than 9 cm. the patient should be allowed to go to term and be delivered by abdominal section.

FIG. 137.



Rhachitic pelvis.

In cases where labor occurs spontaneously in such pelves the head enters the brim of the pelvis turned transversely and inclined laterally upon itself. If the skull be not ossified and labor-pains be strong, the skull may mould itself to the cavity of the pelvis and be born without intervention. The head will be pressed upon and irregularly moulded, but fatal injury need not necessarily occur.

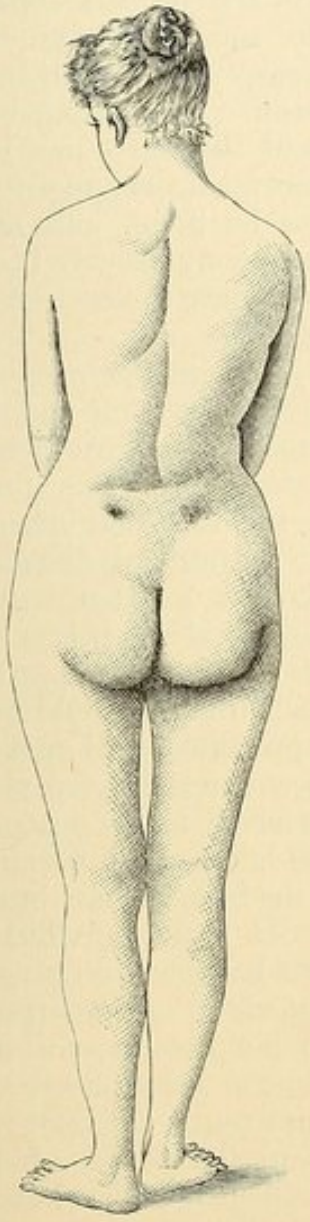
Rhachitis may deform the pelvis in irregular ways, considerably enlarging some diameters and lessening others. It may be associated with spinal deformity, which alters the direction of the pelvic axis and complicates delivery by forceps. The frequency of its occurrence, and the fact that it may be accompanied by fœtal rhachitis, make it a most interesting and important complication in labor.

By simple flattened pelvis is understood a pelvis contracted in its antero-posterior diameter only. In many cases the transverse diameter of the pelvis is increased, while the antero-posterior is diminished. The causes of flattening of the pelvis are failure on the part of the patient to walk and actively exercise, and thus supply, through the femora, the counter-force needed to develop the two lateral halves of the pelvis symmetrically. The weight of the body and spinal column directed downward tend to force the promontory of the sacrum downward and

forward. This force is opposed normally by the force directed against the sides of the pelvis through the femora while the patient walks.

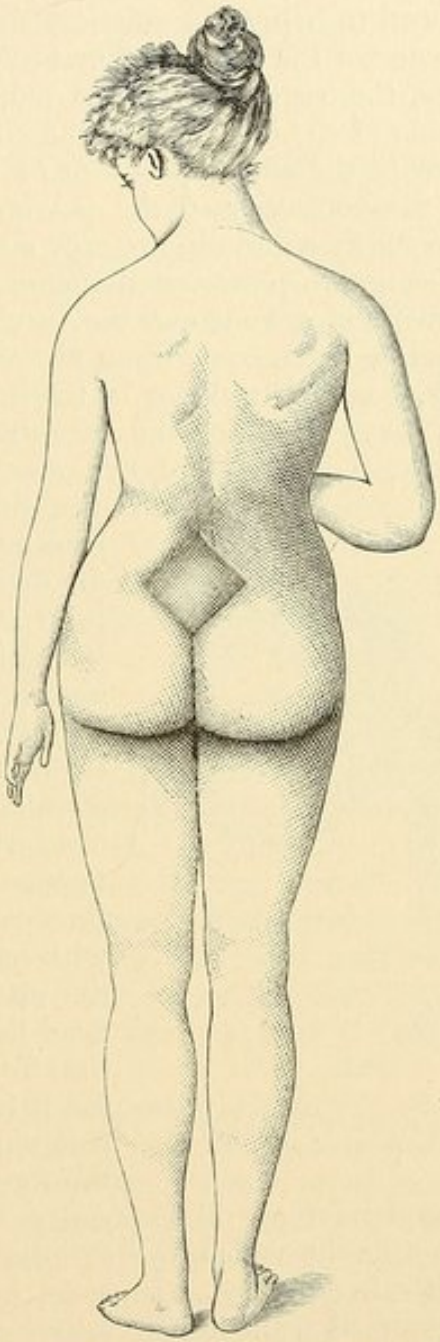
If the patient suffers from infantile paralysis or from any cause which prevents exercise while the pelvis is developing, flattening may

FIG. 138.



Woman with flat pelvis, showing imperfect contour of back. (STRATZ.)

FIG. 139.



Well-formed woman, with lozenge-shaped space in back plainly marked, showing normal pelvis. (STRATZ.)

result. No other cause is known for this condition in the pelvis, and no other deformity is present in the skeleton, nor is there a history of disease to excite the suspicion of the physician.

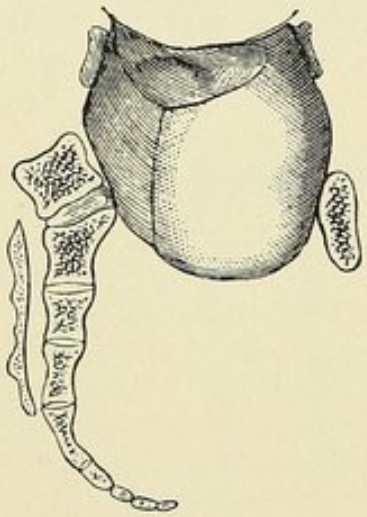
The diagnosis of flattened pelvis is made by pelvimetry and by internal examination. If the pelvis be measured, the shortening in

the antero-posterior diameter will attract attention at once. The fact that no other diameters in the pelvis are contracted will lead to a diagnosis of simple flat pelvis. By internal examination the fingers pass readily to the promontory of the sacrum, although the other portions of the pelvis show no signs of deformity.

The course of labor in simple flat pelves results from the effort of the head to bring its smallest diameter in relation with the smallest diameter of the pelvis. The head will be found transversely across the pelvis, the occiput upon one side and the face upon the other. This position of the head brings the bitemporal diameter of the skull in relation with the antero-posterior of the pelvic brim. The occiput will fit into the concavity of the pelvic brim at one of the sacro-iliac joints, while the face and chin occupy a similar location upon the opposite side. If the antero-posterior diameter of the pelvis be 9 cm. and uterine contractions are strong, the head may descend spontaneously through the pelvic brim, come upon the pelvic floor, and rotate the occiput anteriorly, completing labor in the normal manner.

In cases in which the patient is seen early, before the membranes rupture, it is preferred by some to perform podalic version and bring the child through the pelvis with the head coming last. The reason for this method of delivery lies in the fact that when the head comes last the bitemporal diameter is brought most easily into relation with the antero-posterior diameter of the pelvic brim, and thus the head can be made to pass through the pelvis when labor would be impossible if the head presented. If spontaneous birth does not occur in small, flat pelves, version is to be preferred to the use of the forceps, because the latter must be applied with one blade over the face, thereby injuring the child severely. In cases in which the head has engaged, but has made no progress, the effort should be made to bring it through the pelvis by suprapubic pressure until it can rotate partially upon the pelvic floor, when the forceps may complete the delivery.

FIG. 140.



Head engaging in flat pelvis. (SCHROEDER.)

Symphysiotomy is especially well adapted to flat pelves of little contraction in which the external parts are sufficiently developed to permit safe delivery. In cases, however, in which the pelvis measures less than 8½ cm. in its antero-posterior diameter delivery must be effected by abdominal section.

The mortality-rate for the mother in simple flat pelves is not necessarily high if early diagnosis is made and good judgment be used in selecting the method of delivery. The mortality for children is also not excessively high where the degree of pelvic flattening is slight. Where, however, the pelvis is considerably narrowed, if version be performed and the head be dragged forcibly through the pelvis, the skull may be fractured by contact with the promontory of the sacrum. In

difficult extractions it is often necessary to put the finger in the mouth of the child and aid delivery by strong traction upon the lower jaw. This may also injure the child by causing respiration and favoring the inspiration of material from the vagina and the development of inspiration-pneumonia. In the high degrees of flat pelves the induction of labor should not be practised, but the patient should come to term and be delivered by abdominal section. If labor be induced at eight months in cases where the antero-posterior diameter of the pelvis is 9 cm., the chance for the birth of a living child is sufficiently good to warrant the selection of this method of treatment.

As regards the treatment of labor in the forms of contracted pelves which have just been considered, it is of the greatest importance that early diagnosis be made. This cannot be assured unless the physician makes it a routine matter to examine all cases by pelvimetry. In view of the serious consequences which follow failure to recognize contraction of the pelvis, and inasmuch as pelvimetry, properly conducted, requires no exposure of the patient and adds nothing to her risk by infection, there can be no reasonable objection to this practice.

When an abnormality in the pelvis is observed, the comparative size of the fœtus must next be considered by palpation. It is well to combine with palpation a thorough internal examination of the pelvis. This often requires anæsthesia; but in view of the importance of such knowledge the use of anæsthesia is not only justifiable in these cases, but clearly indicated. Chloroform and bromide of ethyl are well suited for such use, and are but slightly disagreeable to the patient. If it be found that the fœtus can engage in the brim of the pelvis and can be readily pressed downward into the pelvic brim, if viability is assured, labor may be promptly induced with the expectation that a living child will be born without surgical interference. If, however, the head will not engage, the time for the induction of labor is past, and the choice of delivery by surgical operation must be made. The decision should be made after consultation with the parents of the child, and should they prefer to have labor induced, with the understanding that the child's life will be sacrificed if it cannot be born through the vagina, their choice must be accepted.

The question of craniotomy upon living children is a matter of individual conscience. Obstetrically considered, in cities where patients can be taken to hospitals and good surgical care secured, physicians are at perfect liberty to retire from the case rather than destroy the life of the fœtus. The statement must be made that a reasonable chance of recovery for mother and child exists by surgical delivery. If the parents are not willing to take this risk, but demand craniotomy, the attendant may retire and someone else be summoned. In cases, however, of practitioners who are without hospital accommodations, and often without competent assistance of any kind, the situation is different. The chance for mother and child by surgical delivery and by craniotomy must be clearly stated to the parents, and, if the assistance of one or more physicians who are intelligent and conscientious enough to be clean can be secured, delivery by surgical procedure may be undertaken. If, however, such aid cannot be procured and craniotomy is

demanded, the practitioner must remember that the mother's life takes precedence, and it is his duty, under protest, to accede to the exigencies of the situation.

Where the services of a priest have been requested by the patient and her friends, his influence will usually be given against embryotomy and in favor of any method of delivery offering a reasonable hope for mother and child. If the physician wishes to avoid embryotomy, he will do well to enlist the aid of the priest, which is usually given with alacrity.

The after-results of neglected labor in the more common forms of contracted pelvis are sufficiently trying to urge upon the physician the duty of prompt relief. If delivery is accomplished without assistance, it is often at the expense of laceration or fistula to the mother, and frequently at the cost of the child's life. Those who neglect labor in contracted pelves are rarely sufficiently intelligent to practise antiseptic precautions, and hence puerperal sepsis is often added to complicate recovery. Rupture of the uterus may occur in cases where labor-pains are strong and the head cannot enter the pelvis. Postpartum bleeding following relaxation of the uterus often accompanies delivery in these patients. On the contrary, there are few serious complications of obstetrics which give better results in saving the lives of mother and child than do cases of contracted pelves, promptly delivered by suitable operation.

CHAPTER IX.

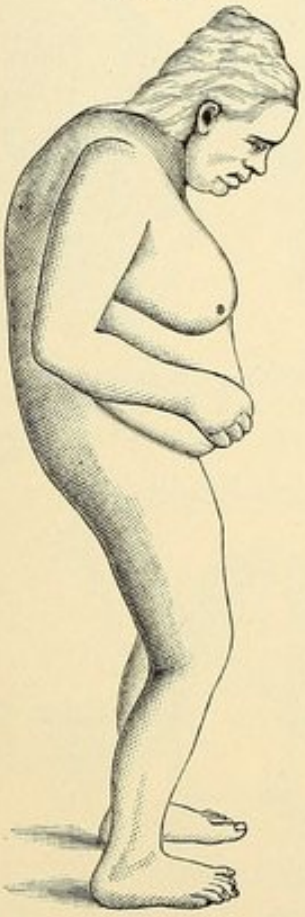
LABOR IN RARE VARIETIES OF DEFORMED PELVES.

In addition to those forms of pelvic abnormalities which have been considered there remain deformities of the pelvis which are not common in the United States. They are occasionally seen, however, sometimes among the foreign population. Among these is the infantile pelvis. In these patients the bones of the pelvis have never assumed the female type. The broadening and shallow form of the pelvis are absent, while in its contour the pelvis resembles that of the male in its depth and narrowness. The cause of this abnormality is unknown, unless it be a variation in the usual laws of development. While pelvimetry will demonstrate the diminished width of such pelves, internal examination will enable the physician to appreciate best their peculiar shape.

The course of labor in these cases depends upon the proportionate size of the child and pelvis and the degree of moulding which the head sustains. If the head can enter the pelvis and moulds readily, then labor-pains may accomplish delivery. The head will be excessively drawn out and the child may suffer serious results from pressure. If,

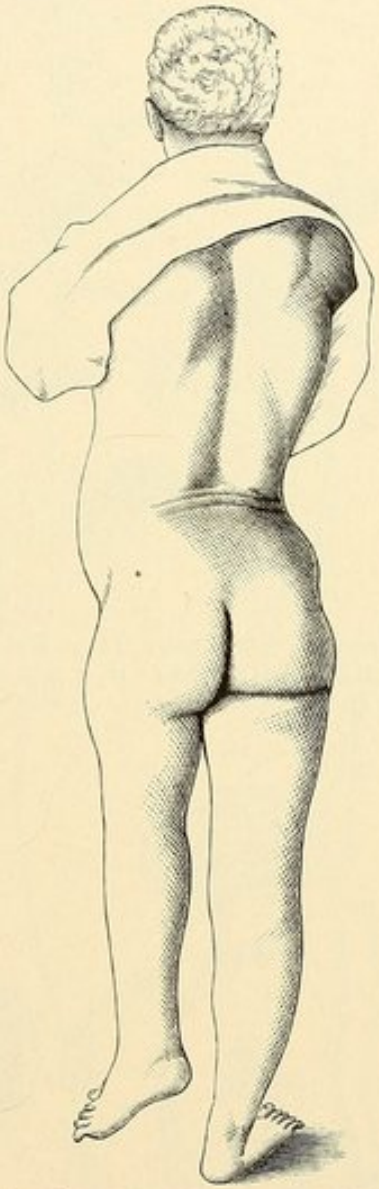
however, engagement cannot take place, delivery must be accomplished by surgical interference. Symphysiotomy is not indicated in these cases, because it enlarges the pelvis least in those diameters which are most contracted. The preferable form of delivery, if a living child is to be secured, must be that of abdominal section.

FIG. 141.



Woman with osteomalacic pelvis.
(POLGÁR.)

FIG. 142.

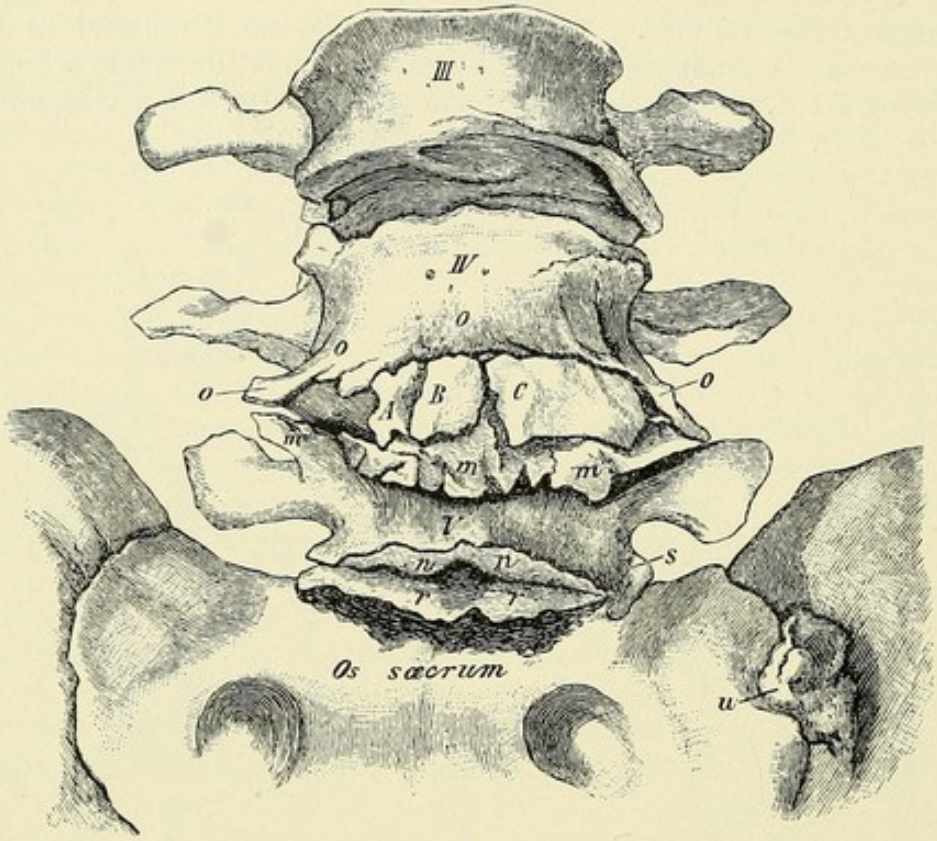


Obliquely contracted (Naegele) pelvis.
(SALUS.)

Osteomalacia is occasionally seen, and produces well-marked pelvic deformity. The pelvis in these patients is gradually lessened in capacity. The rami of the pubes assume the beak shape. The contraction of the pubic joint narrows the pelvis greatly at this point. The sacrum may also be found in abnormal positions in these cases, projecting downward and forward or turned to one side. If the disease be well marked, not only the pelvis, but other portions of the skeleton will suffer from softening and deformity.

The treatment of labor in these cases consists in delivery by abdominal

FIG 143.



Spondylolisthesis. Third, fourth and fifth lumbar vertebræ. (NEUGEBAUER.)
A, B, C. Osteophytic disks. *m, m, m, o, o.* Marginal hyperostosis of bodies of vertebræ. *n, n, r, r.* Everted and deformed edges of vertebræ at sacral promontory. *u.* Exostosis at left sacro-iliac joint.

FIG. 144.

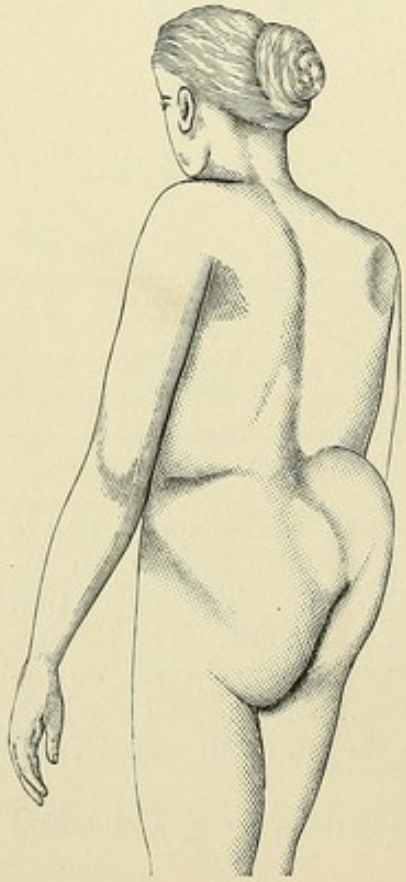


FIG. 144.—Woman with spondylolisthetic pelvis. (NEUGEBAUER.)

FIG. 145.

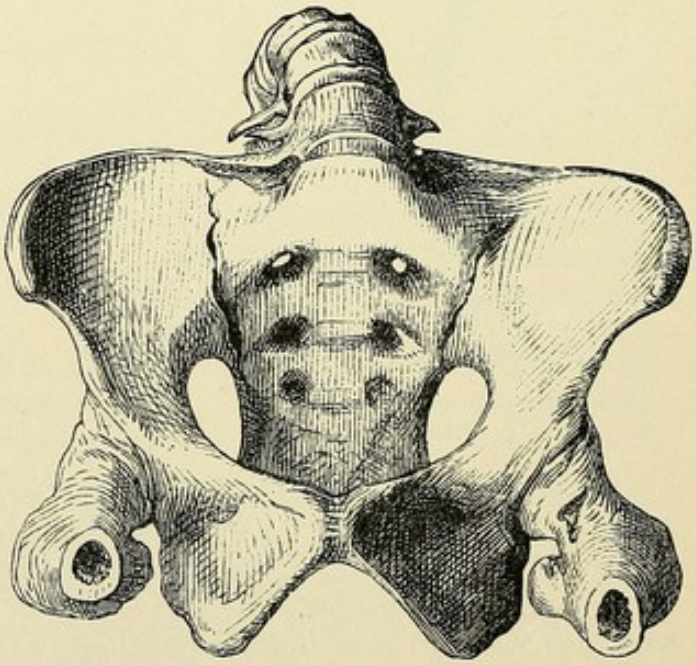
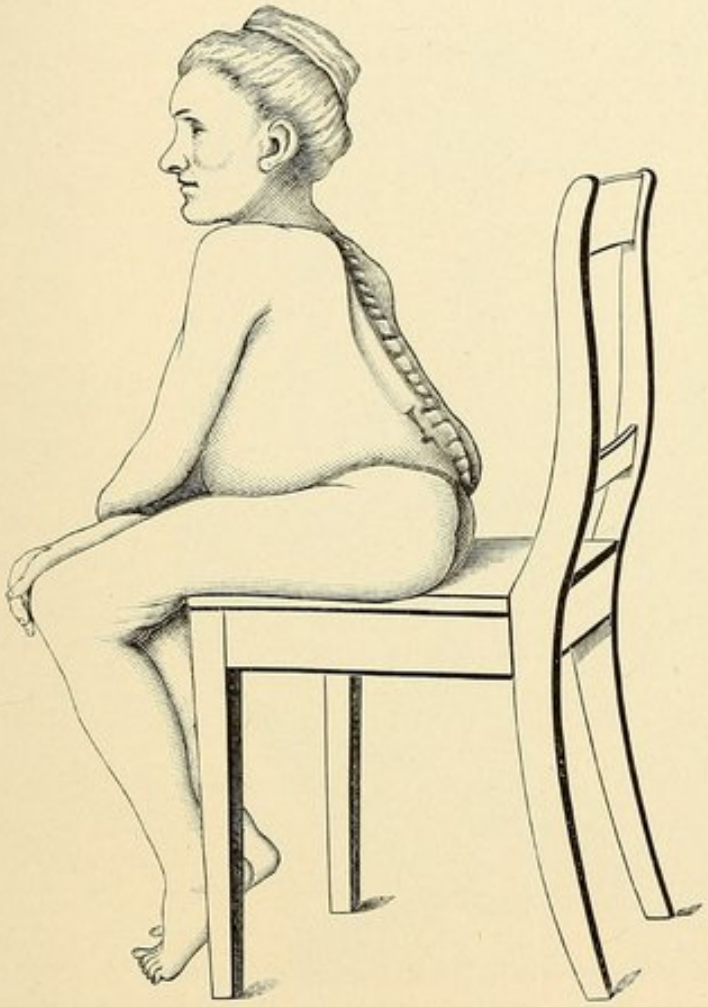


FIG. 145.—Kyphotic, laterally contracted, pelvis. (WEGSCHEIDER.)

section, followed by hysterectomy, with removal of the tubes and ovaries. Experience has shown that such cases are best treated by oöphorectomy, and that the disease in pregnant women is checked by this procedure.

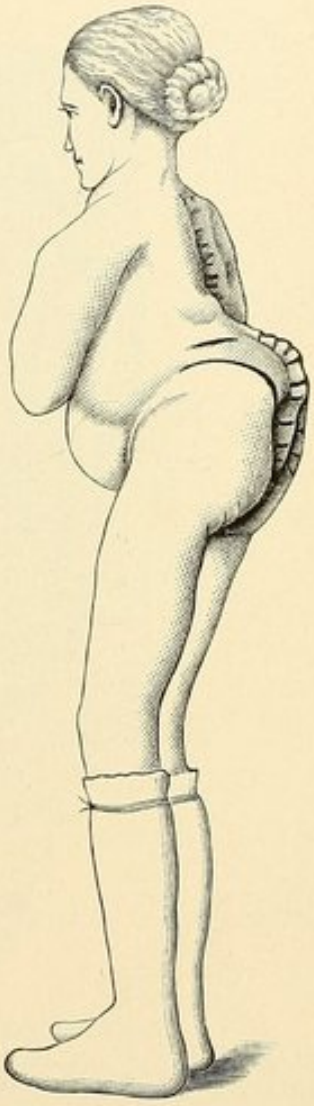
The pelvis may also be narrowed in some cases by contraction in one of its diameters only. Thus the transverse diameter is occasionally much shortened. Any cause which checks the development of the pelvis may shorten its capacity in one of its diameters, often an oblique.

FIG. 146.



Woman with kyphotic pelvis.
(KLIEN.)

FIG. 147.

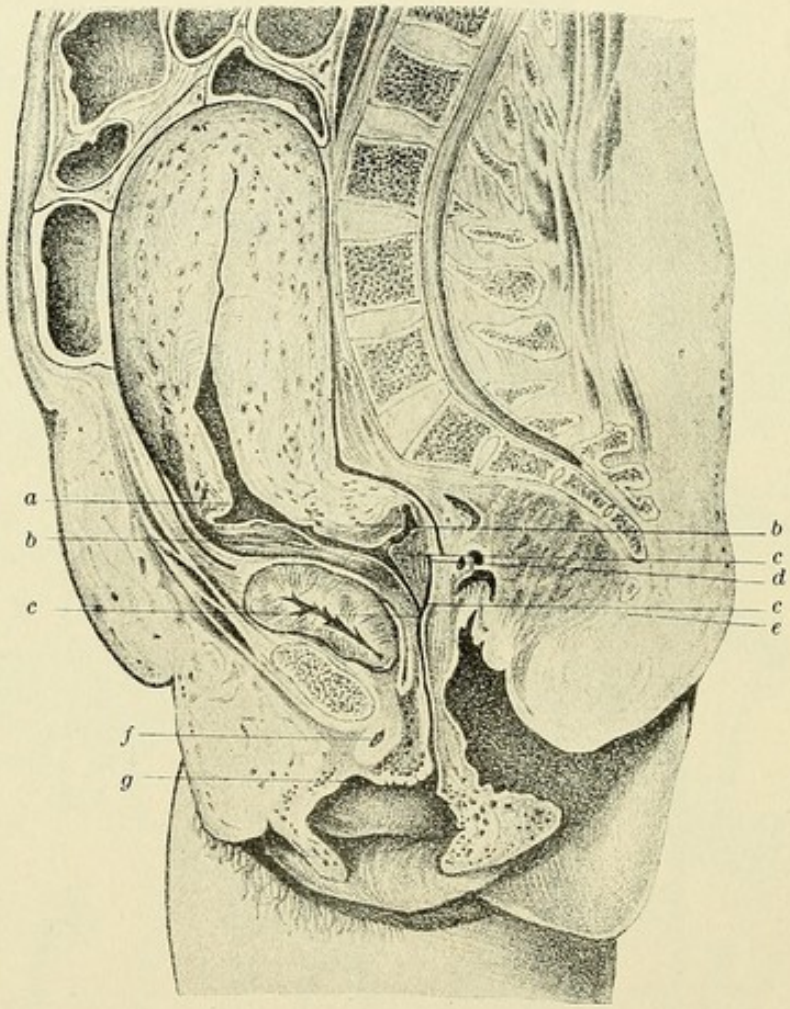


Woman with kyphotic pelvis.
(KLIEN.)

Direct violence, as a fall or blow, may fracture the pelvis, and the callus which results may lessen the diameter of the pelvic cavity. Disease of the pelvic bones, as tuberculosis of the hip-joint, may also change the form of the pelvis. Sarcomata may grow from the connective tissue of the pelvis, obstructing the pelvic brim. Spinal deformity occurring in the lumbar region may force the sacrum downward and alter the shape of the pelvic brim. Thus a combined dislocation of the vertebræ of the lumbar and sacral regions upon each other may produce

the deformity known as spondylolisthesis. Lateral curvature of the spine, termed scoliosis, may cause partial rotation of the sacrum and alter the shape of the pelvic brim. Projection forward of the vertebræ caused by tuberculosis of the bodies may produce the deformity known as lordosis; while hunchback, or the projection backward of the vertebræ, may cause kyphosis. Spinal deformity may not actually prevent the entrance of the head into the pelvis; but if it be well marked, it will alter the position of the uterus in the abdomen, will impede the descent of the head, and will prolong and complicate labor.

FIG. 148.



Vertical mesial section, contracted pelvis. (STRATZ and WEBSTER.)

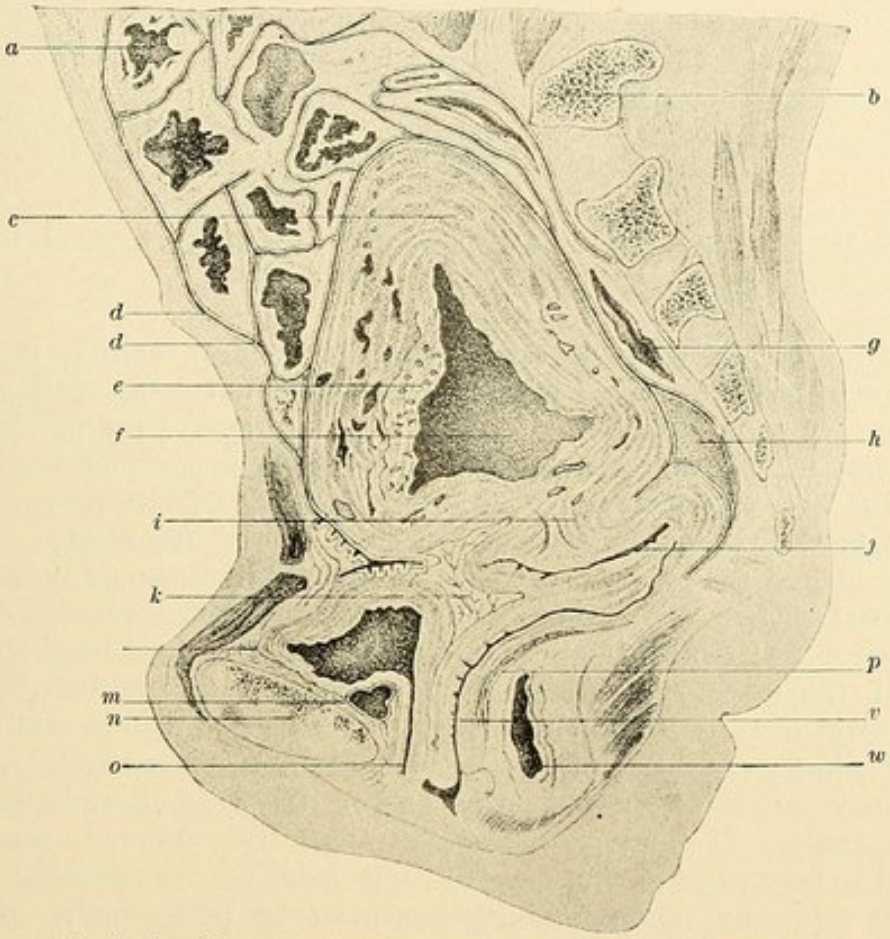
a. Umbilicus. *b*. Retraction-ring. *c*. Cervix. *d*. Posterior fornix. *e*. Tip of coccyx. *f*. Urethra. *g*. Urethral orifice.

There can be but one reasonable view of the treatment of these cases of pregnancy in greatly deformed individuals. The offspring of such parents are rarely endowed with health and vigor, and the birth of children in these patients requires interference often of grave character. With the exception of cases of osteomalacia, pregnancy should be continued to term, every precaution being taken to maintain the mother's health and promote her nutrition during gestation. Delivery should be accomplished by abdominal incision, and further impregnation should

be rendered impossible by hysterectomy, with removal of the tubes and ovaries. In cases of osteomalacia where the disease is advancing delay must not be practised, but pregnancy should be terminated at once.

The prognosis for mothers and children in these cases is the worst possible if the cases are neglected and allowed to come into spontaneous labor. On the other hand, mother and child have an excellent chance for recovery if delivery be performed at term by surgical interference. These cases are far less dangerous in many respects than are those of less pronounced pelvic deformity. The dwarf and the cripple are so evidently diseased that, if they become pregnant, attention is drawn at once to

FIG. 149.



Vertical mesial section, kyphotic pelvis. (BARBOUR and WEBSTER.)

a. Small intestine. *b*. Last lumbar vertebra. *c*. Uterus. *d*. Peritoneum. *e*. Placental site. *f*. Uterine cavity. *g*. Rectum. *h*. Pouch of Douglas. *i*. Cervix. *j*. Cervical canal. *k*. Cellular tissue. *l*. Bladder. *m*. Vein. *n*. Symphysis pubis. *o*. Urethra. *d*. Cellular tissue. *v*. Vagina. *w*. Anus.

their condition and the question of delivery is promptly raised. In the lesser forms of pelvic abnormality there is often nothing to draw attention to the condition, and unless pelvimetry be practised patients come into labor without suitable preparation, and are allowed to linger until it is evident that delivery without assistance is impossible. As a result, the most frequent successes in obstetric surgery have, many of them, been obtained in cases of highly deformed pelves. On the contrary, many fatal cases of labor, where mother or child or both have

perished after prolonged efforts at delivery, have been cases of medium pelvic contraction which was unrecognized by the attendant.

Not only should physicians practise the examination of the pelvis in every case, but their patients should be taught that such a procedure is part of the care which they have a right to claim from their medical attendant. The physician is not criticised unfavorably for taking precautions, but for neglecting them; and as long as he suggests to his patient no form of investigation which increases her risk, gives pain or great inconvenience, he should insist upon his privilege in this regard.

CHAPTER X.

LABOR IN CASES COMPLICATED BY TUMORS OF THE PELVIS AND GENITAL ORGANS.

Labor may be seriously complicated by tumors arising from the pelvis or by growths which take their origin from some of the pelvic viscera. Allusion has already been made to tumors of the pelvic bones which may offer great obstacles to labor. Cancer may attack the rectum or uterus and encroach upon the lower portions of the pelvic cavity, preventing delivery. In diagnosticating cancer of the rectum it must be remembered that occasionally the bowels are so thoroughly impacted with fæcal matter that it may give to the finger the sensation of the hardened mass found in malignant disease. If the bowel be thoroughly emptied, this obscuring element in diagnosis is readily removed.

The treatment of malignant disease affecting the rectum and attacking the connective tissue of the pelvis and uterus is entirely surgical. Pregnancy should be ended as soon as the diagnosis of malignant disease is made. If birth can occur through the vagina, it should be allowed to take place in that manner; but if delivery is rendered impossible in this way, abdominal section must be performed. If labor occurs at term in a patient suffering from malignant disease in whom delivery is delayed by cancerous tissue, abdominal section and delivery by total hysterectomy are indicated.

Labor may be rendered impossible by fibroid tumors of the uterus. Submucous tumors are often detached from the uterine tissue during labor, and, a pedicle forming, may present in advance of the head in labor. At the beginning of labor such a tumor may be found near the head and apparently blocking up the pelvis. In these cases, as a rule, nature succeeds in effecting delivery by gradually drawing the tumor up and forcing the head down. After the birth of the child the tumor may present and be partially delivered, occasionally with inversion of the uterus. The physician should not despair of normal delivery as long as the head advances at all in these cases. If the tumor presents

before the birth of the child, its pedicle must be ligated and removed. If it is discovered after the expulsion of the fœtal body, the same treatment is indicated, care being taken not to make traction upon the pedicle to avoid inverting the uterus.

Interstitial fibroids may seriously complicate labor by blocking the cavity of the pelvis and preventing the descent of the child. The recognition of this complication demands thorough examination under anæsthesia. The treatment of labor complicated by interstitial fibroids of large size is hysterectomy. Where the tumor is small the head may be delivered with forceps. The mother is exposed to danger by hemorrhage in these cases, as the vessels of the endometrium which cover the tumor are enlarged, and, if these tissues are torn in delivery, it will be necessary to tampon the uterus with gauze to check bleeding. In choosing abdominal delivery in labor complicated by fibroids the operator must remember that a uterus the seat of fibroid disease will not heal after incision and suture. Hence the reason for choosing hysterectomy in these cases and declining cœlio-hysterotomy.

Subserous fibroids complicating labor can usually be pushed aside if pedunculated, and the fœtal body be brought to descend. If, however, the tumor has no pedicle, abdominal incision and myomectomy are required. If the bed of the tumor and serous covering be closed by successive layers of suture, hemorrhage can usually be controlled. If, however, too large a cavity be left when the tumor is shelled out, to avoid bleeding its bed may be tamponed with gauze, which may be brought out through the abdominal incision. If the tumor is large, it is best to perform hysterectomy.

Labor complicated by ovarian tumors resulted fatally to the mother, in the majority of cases, before the days of antiseptic surgery. If an ovarian cyst be impacted at the brim of the pelvis, it may be ruptured by strong labor-pains, its contents escaping into the peritoneal cavity. Peritonitis will follow with usually fatal results. Ovarian tumors may become strangulated by torsion of the pedicle developing during labor. A solid tumor of the ovary may be forced down and into the pelvis, making spontaneous delivery impossible.

In these cases the first effort should be to push the tumor gently to one side and bring the head into the brim of the pelvis. This will require anæsthesia, and must be done gently to avoid rupture. Should this effort fail, if the tumor be a cyst and low in the pelvis, it may be punctured and emptied and drained. This, however, while often the more feasible plan of treatment, is less safe than abdominal section and the removal of the tumor. The danger of septic infection after puncture is great, and should be avoided if possible. In cases where the tumor bursts the abdomen must be opened as soon as possible and thoroughly washed out with normal saline solution. The tumor should be removed. Solid tumors of the ovary may be more safely dislodged by manipulation, but should they become impacted their removal is a necessity. Often, if craniotomy be performed, the tumor would be so bruised and injured that necrosis of its tissue would result, followed by the development of septic poison.

Cysts of the broad ligament may rupture during the early stages of

delivery with but little damage to the patient. The fluid of these tumors is usually clear and sterile, capable of absorption without injury, while the process of rupture brings about a spontaneous cure.

Hernia may complicate labor and seriously threaten the mother's life. This hernia may be intestinal and femoral in variety, or occasionally hernia of the uterus develops. The bowel may also descend into the labium and be mistaken for vulvo-vaginal abscess. A swelling occurring in the region which hernia may occupy should not be hastily punctured or incised, but should be reduced, if possible, by taxis.

Should intestinal hernia complicate labor, and reduction by taxis be impossible, operation for strangulated hernia should be performed. The results of such an operation should be quite as good as in the non-pregnant patient, while the operation itself need not complicate the patient's recovery from labor.

Hernia of the uterus may occur in patients whose tissues have been greatly weakened by anæmia or exhausting disease or by repeated overdistention. The indications for treatment in these cases are to replace the uterus in its proper position and to maintain it there by a suitable abdominal bandage. Ventral hernia will usually follow these cases and may demand operation.

The labia may become infiltrated with serum during labor, and the degree of distention may be so great as to delay the expulsion of the child. It is better to avoid puncture and to hasten delivery by forceps with these patients. Especial care must be taken to maintain the parts in an aseptic condition, as the tissues readily break down if infected in these cases.

An effusion of blood into the labia may occur, forming hæmatoma during labor. This may be caused by the rupture of a vein or by long-continued pressure upon unyielding tissue. The distention may become so great that rupture may follow, with severe bleeding. It is well in these cases to effect delivery as soon as possible in the hope of avoiding rupture. Should this occur, however, a firm tampon of gauze may be applied until delivery is completed. The edges of the torn tissues must then be brought together by deep, continuous, catgut stitch, the vagina firmly tamponed with iodoform-gauze, and a firm antiseptic dressing applied over the vulva. These cases readily recover if septic infection does not occur.

Hemorrhoids may prolapse during labor and become greatly swollen and strangulated, causing great suffering and delaying expulsive pains. If very hot water or ice be applied for a few moments, these tumors can often be reduced by firm but gentle pressure. Anæsthesia may sometimes be necessary to secure their reduction. Should it be impossible to reduce them, they may be ligated and completely divided by a sharp bistoury and the interior of the tumor emptied of blood and thoroughly disinfected with antiseptic solution.

The following applications to hemorrhoids after ligation and incision have been found useful :

Pure carbolic acid Glycerin	}	each 1 drachm.

To be applied with a piece of soft pine-wood, the end of which is cut to fit the surface of the incised hemorrhoid. Bichloride of mercury, 1 : 500, may also be used, followed by the application of normal salt-solution. The thermo-cautery is an excellent application, followed by free dusting with powdered boric acid.

During the puerperal period hemorrhoids should be powdered heavily with iodoform or boric acid.

Cystocele and rectocele may complicate labor and cause confusion in diagnosis. A large cystocele may be mistaken for the fœtal membranes and may be punctured. If careful examination be made, it will be found that the finger can be passed along the anterior vaginal wall to the cervix and the fœtal membranes distinguished at this point. A positive diagnosis may be effected by thoroughly emptying the bladder by catheter. Rectocele is rarely a serious complication of labor, and is usually readily replaced by the fingers as the head descends.

CHAPTER XI.

SEPTIC INFECTION.

By the term septic infection is understood the development in the mother's tissues during labor of poisonous material formed from the cellular elements of her tissues, or the introduction within her body of poisonous germs and their products from without. The first process is styled by some sapræmia, while the term septic infection is limited to poisoning by germs and their products. While it is important to distinguish sharply between the two, clinically cases are seen in which symptoms of poisoning follow bruising and injury of the mother's tissues, when every precaution is taken to avoid the introduction of septic germs. On the other hand, cases are not uncommon in which symptoms of septic infection are clearly defined before the termination of labor, while in others the condition develops unmistakably during the puerperal state.

In cases of prolonged and neglected labor in which strong uterine contractions have forced the head of the child against the pelvic tissues it is usual to observe a gradual rise of temperature to 101°, 102°, or 103° F., accompanied by a pulse ranging from 100 to 120. These cases are frequently terminated with laceration of the mother's tissues. Many of these patients are entirely without assistance and without interference as far as examinations are concerned or actual contact with the genital organs. If septic infection does not occur and delivery is secured, the temperature gradually falls, its decline being accompanied by free perspiration and without chills. The same phenomena are observed during and after prolonged and difficult labor conducted under antiseptic precautions,

but terminated by instruments or by version. The most rational explanation from a practical standpoint for these cases ascribes the fever to the absorption of necrosed tissue resulting from the mechanical injury of long-continued labor: this condition is termed sapræmia.

The treatment of labor complicated by sapræmia consists in the thorough observance of antisepsis and the prompt termination of labor. Lacerated surfaces should be promptly closed by suture and uterine contraction secured.

Where the tissues of the cervix, pelvic floor, and perineum have been severely bruised and lacerated, it would seem at first sight unreasonable to expect union after suture. If the patient is exhausted as the result of labor, it is well to wait from twenty-four to thirty-six hours after delivery before attempting to bring together torn surfaces. The parts must be kept thoroughly clean by douches of bichloride of mercury, 1 : 8000, given every six hours and at as high a temperature as the patient can conveniently endure. This should be followed by free powdering with boric acid. An antiseptic dressing must be worn over the vulva. The result of such delay will be to diminish greatly the swelling in the parts and to put the tissues in much better condition after suture. After such delay the patient may be anæsthetized and the torn tissues brought together. In sewing up such lacerations care must be taken to select a suture-material which will not readily cut through and to avoid tying the stitches tightly. Good-sized silk, soft in texture, is the best material and may be used in interrupted or continuous suture. Such stitches, if interrupted, should be left in place for ten days after their insertion. It is often necessary to remove only the knots from a continuous silk or chromicized catgut suture if left for two weeks, as much of the fibre is absorbed.

The after-treatment of such cases, in which the tissues have been greatly bruised and torn, consists in the maintenance of strict surgical cleanliness. In using the douche in these patients none but the fountain-syringe should be employed, and, if the sutures are low in the vagina, a spray-nozzle is often advantageous. Bichloride of mercury in solution sometimes causes necrosis of bruised tissue, which is seen by a grayish film which forms upon the surface. In these patients bichloride may be substituted by normal saline solution or saturated solution of boric acid. This should be followed by free powdering with boric acid or acetanilid. Care should be taken to catheterize the patient for two or three days after such labor, and, if the tissues about the meatus are greatly swollen, it is well to drain the bladder by leaving a catheter to which is attached a rubber-tubing terminating in a basin of antiseptic solution. The bladder should be irrigated with saturated solution of boric acid once daily by injecting the solution through the catheter. The results obtained in these cases are often much better than seems probable when the serious nature of the original injury is considered.

It is well to assist the patient in getting rid of poisonous material by free purgation. In cases which have been neglected and seen amid surroundings of external filth general cleanliness must be secured as far as possible. The vulva should be kept covered with an antiseptic occlusion-dressing, which must be applied and renewed most carefully.

Direct septic infection occurs during delivery by direct contact by hands, instruments, or articles used about the patient. It may also be observed in cases in which the patient's body before labor has contained septic germs which have been liberated during the process of birth. Thus it is possible for a patient suffering from gonorrhœa, syphilis, or cancer to liberate germs already existing in her body, and for their absorption during labor to produce infection. This is styled septic infection. A gonorrhœal abscess in the Fallopian tube may burst during labor and rapid infection result. A chancre in the cervix or vagina may give rise to infection during labor, followed by the rapid development of sepsis. Delivery through a cancerous uterus may be followed by rapid septic absorption, with fatal results.

The symptoms of infection occurring in this way are chills, followed by sweating, fever, and a rapid pulse—from 120 to 140. The expression of the patient is depressed and anxious, and her aspect is that of beginning surgical shock. Uterine contraction after delivery is often deficient, and postpartum bleeding may occur. The predominant symptom, which is of greatest importance as indicating the treatment, is the condition of shock and depression, which is not seen in cases complicated by sapræmia. Acute septic infection may also be conveyed to the patient by germs introduced into the circulation by the hands, instruments, or appliances of those who attend her. The period of development required for these germs usually causes their first effect to become apparent from two to three days after delivery. This, however, is true only of those cases in which infection takes place in the tissues of the vulva or vagina. Where septic germs go directly into the uterus and enter the blood through the open sinuses the condition may become apparent even before the termination of a prolonged and difficult labor.

Acute sepsis occurring directly during labor is a complication of the utmost gravity. In cases in which there is reason to believe that the patient has been thus infected the choice of a method of delivery may depend entirely upon the presence of this complication. If the uterus has become infected during prolonged and complicated labor, it is best so to perform delivery that the uterus shall be removed with the child. It is useless to deliver the patient by symphysiotomy or Cæsarean section, leaving a thoroughly septic uterus within the body. In cases in which the physician is summoned after prolonged and unsuccessful labor, should he find the patient infected or should he observe a total lack of antiseptic precautions on the part of those who have examined her during labor, he will do wisely to modify his plan of delivery in accordance with these facts. Hysterectomy, or total extirpation of the uterus, tubes and ovaries, will give the patient the best chance for recovery.

The patient's condition of shock is a valuable clinical index as to the degree of infection present and her ability to resist septic poison. As a rule, she will react more quickly and successfully if an infected uterus be removed, either wholly or in part, than if it be left behind.

The development of septic infection, arising in lesions of the vagina or perineum, is rarely complete before the second or third day of the

puerperal stage, and hence the later form of the disorder will be considered under diseases of the puerperal state.

The treatment of septic infection during labor comprises the thorough practice of obstetric antisepsis. As most of these cases arise in patients who are debilitated by long and exhausting labor, and often in cases in which hemorrhage and injury to the birth-canal have occurred to weaken the patient, there is room for a choice in the selection of an antiseptic and the method by which it is employed. Experience has shown that in patients weakened by prolonged labor and depleted by hemorrhage mercurial poisoning is more apt to follow the use of bichloride of mercury than in the cases of patients who are in good general health. It is well to limit the use of bichloride of mercury to the hands and the appliances of the attendant, to the external portions of the patient's body, and to surgical dressings. For douching the uterus hot, sterilized water, normal salt-solution, creolin or lysol, boric-acid solution, carbolic acid, thymol, alcohol and water equal parts, or diluted iodine may be employed to advantage. For cleansing the vagina a combination of creolin and soap is exceedingly useful. For maintaining the uterus and vagina in an antiseptic condition immediately after delivery antiseptic or iodoform-gauze may be employed in strength of 50 per cent. of iodoform. During prolonged labor and especially during the various stages of induced or complicated labor, the vulva should be covered by an occlusion-dressing of gauze impregnated with bichloride of mercury, 1 : 2000.

The general treatment of a patient during prolonged labor, and especially of a patient who has become infected in labor, requires an active and persistent use of stimulants and easily digested food. Strychnine is the most valuable of tonics, and may be given by hypodermatic injection as soon as the uterus is emptied. Alcohol may be given by rectal injection in the form of brandy with beef-extract or whiskey with milk or brandy and egg. Digitalis and atropine may be administered by injection should any indication arise for their use. It is of the utmost importance that as labor goes on, and especially as the birth is completed, that firm uterine contractions be secured. It will be found that strychnine and alcohol will often have more value than ergot in securing this result.

The fœtus may also become infected by sepsis during labor. In cases in which birth is prolonged, as soon as the membranes rupture septic material from the vagina may gain access to the eyes, the nose, and the mouth of the child. Children may be born with ophthalmia, with gonorrhœal infection of the mouth and nose, and with a beginning septic inspiration-pneumonia. All that can be done to avoid these complications consists in thoroughly cleansing the genital tract of the mother before delivery. In cases in which infection is feared the eyes should be thoroughly cleansed with sterilized water, followed by the use of nitrate of silver, one drop of a 2 per cent. solution. The mouth should be cleansed with saturated solution of boric acid, preferably by spray, and the nostrils may also be similarly treated. The newborn infant should be held suspended with its head lower than its body after birth, that fluid or mucus may emerge from the mouth and nose.

This is best accomplished immediately after delivery by suspending the child by its feet for several minutes. Septic infection may also enter the body of the child through its umbilical cord, hence especial care must be used in dressing the cord.

The mortality-rate of mothers who are infected by sepsis during labor itself is very high, the majority of such cases ending fatally. Where sapræmia develops the prognosis for recovery is good, provided septic infection is not added to the complications already existing.

The prognosis for children born during labor complicated by septic infection is also grave. If promptly treated, ophthalmia can be controlled, in the majority of cases, without serious results. Inspiration-pneumonia and septic infection of the umbilicus are, however, usually fatal.

While septic infection arises in the great majority of cases from germs introduced within the body of the patient from without, there are certain conditions of the body in which septic germs are present or may be developed before labor. Cancer and syphilis in the pregnant patient expose her to acute infection at the time of parturition. Erysipelas, typhoid, appendicitis, pre-existing infection of the tubes or ovaries, and others of the acute infections, expose her to a like danger. These cases are not purely autoinfection, because the original source of the disease was brought to the patient from without. They are, however, autoinfection in the sense that the germ is present before labor, and is introduced immediately into the circulation at that time.

As has been shown in treating of the disorders of pregnancy, such conditions will usually be diagnosticated and removed before the actual beginning of labor. Should, however, the physician be called to his patient for the first time when in labor, and should he find her already infected, all that he can do will be to destroy, if possible, an existing focus of infection before or at the completion of labor. Should an abscess in the appendix or in the tube rupture during labor, abdominal section must be done at once. Lesions of syphilis or cancer must be destroyed by strong antiseptic applications. Labor must be so conducted as to open as few fresh avenues for infection as possible. Every precaution should be taken to enable the patient to resist infection; and while the chance is greatly against her, still the possibility exists that she may escape fatal poison.

Our knowledge of bacteriology teaches us that the intestinal tract may contain bacteria which are practically harmless as long as they remain enclosed in the bowel, but which are capable of exciting dangerous conditions if they enter the lymphatics of the abdominal cavity. Chief among these is the colon-bacillus (bacillus coli communis), which is often accompanied by pus-organisms and sometimes by streptococci. In cases in which obstinate constipation has existed during pregnancy and in which gestation is prolonged and difficult, such mechanical injury may be done to the intestine or surrounding tissues as to cause these germs to gain access to the lymphatics, and thus set up a lymphangitis of the mesentery and finally a purulent peritonitis. In some cases congenital anomalies in the intestine favor the retention of fæces and the development of these germs.

The presence of these germs in the intestine before labor is often difficult to diagnosticate. Where persistent constipation with tympanites is present their activity may be strongly suspected. A positive diagnosis can scarcely be made without a bacteriological examination of the fæces, a procedure which can rarely be carried out.

In the presence, however, of the clinical signs described, it is of great importance that the intestine be emptied as thoroughly as possible before labor. While our knowledge of the action of drugs which affect intestinal bacteria is scanty, it is probable that mercurials followed by salines are the most efficient agents for this purpose. Calomel and soda, 2½ grains, followed by free purgation with Epsom salt, is certainly of value. Where the practitioner sees the patient some days before delivery, minute doses of bichloride of mercury followed by salines and by copious high injections should be of value. The patient's food should be selected to secure absorption from the stomach, and to leave as little residue as possible to undergo fermentation in the bowel. Broths and soups with a small quantity of bread comprise the best diet. Large quantities of milk should be avoided, as the curd tends to distend the bowel and favors the mechanical occlusion of the intestine.

The symptoms of infection proceeding from the intestine are a rapid pulse, with but moderate elevation of temperature; great restlessness, with abdominal distention, but temporarily relieved by lavage of the stomach or intestine. If the case proceeds to a fatal issue, it is usually by the development of obstruction of the intestine from a mass of lymph poured out about the bowel. Symptoms of infection of the genital tract are wanting, the lochia is not foul, and wounds of the pelvic floor and perineum and of the abdominal wall heal promptly.

The treatment of this infection consists in persistent efforts thoroughly to empty the bowel. Spasmodic contraction of the intestinal wall should be overcome by the hypodermatic use of codeia in half-grain doses. One-tenth of a grain of calomel may be given every half-hour until a grain has been taken, followed by salines and by a high injection of glycerin, 1 ounce; sulphate of magnesium, 1 ounce; spirits of turpentine, ½ ounce; water, 1 quart.

The stomach should be thoroughly cleansed by lavage and the cleansing repeated every four hours until the water returns clear. Sterile water or normal salt-solution should be employed for this purpose. Abdominal section for this complication is generally useless, as the source of infection is within the bowel and cannot be removed by flushing the abdomen. This complication is fortunately rare, but it may be distinguished in most cases from streptococcus infection of the genital tract, and calls for especial study in the prophylaxis, and also in prompt and vigorous curative treatment.

SECTION III.

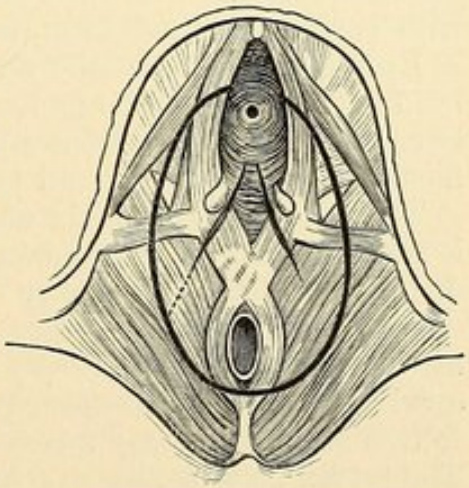
OBSTETRICAL OPERATIONS.

CHAPTER I.

EPISIOTOMY—MULTIPLE INCISIONS OF THE CERVIX—SUTURE OF TEARS OF THE PERINEUM AND PELVIC FLOOR.

By episiotomy is understood the making of incisions into the border of the vulva and vagina to further dilatation at the moment of birth. This procedure is based upon the division of the pelvic floor into anterior or upper segment and posterior or lower segment. In normal labor the anterior or upper segment, which comprises the anterior wall of the vagina and the tissues about the urethra, is pushed upward and forward beneath the pubic arch. As the head emerges the posterior or lower segment is carried downward and backward, including the posterior two-thirds of the pelvic floor, the posterior vaginal wall, and rectum. In cases where the muscles and fascia which form the rim or sphincter of the vulva are tense and resisting the action of these two segments of the pelvic floor is interfered with, and under strong pressure the head will force its way downward, tearing the pelvic floor at each side from its attachments to the pelvic bones and fascia and tearing the perineum in the central line often to the rectum. The purpose of episiotomy is to cut this tense, resisting, sphincter-like band of tissue and thus permit the two segments of the pelvic floor to dilate in the normal manner.

Fig. 150.



Double episiotomy. (Dührssen.)

The advantages of episiotomy are those which a clean incision has over a ragged tear, so far as union is concerned. The incisions are also above the floor of the vagina, and hence are out of the way of the lochial discharge. They are readily sutured and usually heal by first intention. The disadvantages of episiotomy are the facts that it inflicts additional pain upon the patient unless she be anæsthetized, and that it seems to add an operative interference to the pain and discomfort of labor. As these disadvantages do not outweigh the gain which

this simple procedure brings about, and as episiotomy is not needed in cases in which anæsthesia is not employed, the reasons against its use lose weight entirely.

A blunt-pointed bistoury or blunt-pointed scissors with narrow blades may be employed to make the incisions. A point upon the vulva should be chosen at the juncture of the lower third with the upper two-thirds. The direction of the cut should be downward and slightly outward, and its extent from an inch to one and one-half inches. It is best done by laying the blade of the knife or scissors upon the side of the child's head, inserting the blade an inch within the vagina. When a pain comes on the blade is then turned with its cutting-edge outward toward the wall of the vagina, when the tissues will divide before the edge of the blade.

The raw surface that is left after episiotomy is surprisingly great to one unaccustomed to this procedure. The tissues instantly retract both upward and outward, and there is left a triangular, raw surface, the base of which marks the extent of separation at the outer extremity of the episiotomy-cut. The bleeding is but slight, as only mucous membrane, connective tissue, and thin muscular fibre are divided. The difference in the dilatation of the pelvic floor and vagina is great. The posterior wall of the pelvic floor instantly drops downward and backward, and the head is usually born rapidly and without difficulty. As soon as labor is complete the incision should be closed by a continuous suture of catgut. The suture should begin upon the inner aspect of the line of incision, and should follow the line of incision directly along the inner aspect of the vaginal wall. It is often necessary to continue the line of suture downward upon the skin-aspect of the incision, thus closing both edges. The lines of suture should then be powdered heavily with boric acid or iodoform, and the suture need not be removed.

Episiotomy is especially serviceable in forceps deliveries where the head is evidently too large to be brought through the vulva without laceration. Its performance will frequently save a tear of the pelvic floor in the lateral sulci and prevent a central tear of the perineum.

The tissues of the cervix may be so firm and resistant that dilatation is wanting, and the head emerges by tearing the cervix, often in several directions. These tears may extend to the vaginal junction upon one or both sides, while in some cases the tissues may yield irregularly, tearing more and more deeply as the head advances. A branch of the cervical artery may be opened and severe bleeding result. Septic infection often gains easy access to the tissues at the points of laceration. The cervix may be also so resisting that labor is impeded by the denseness of the tissues, and exhaustion may be threatened. In these cases it is a justifiable and useful procedure to incise the cervix in several directions. Where rupture of the tissue is threatened two fingers of the left hand should be passed into the cervix, and a probe-pointed bistoury be introduced along the fingers; its edge may then be turned outward, and the cervix incised in several directions to the depth of one-fourth or one-half an inch. Dilatation will then proceed more rapidly, and serious and irregular tearing of the cervix will be avoided.

In cases where rapid delivery is imperative, as in eclampsia, gradual

dilatation cannot be waited for. A pair of probe-pointed scissors, curved at an angle of forty-five degrees, with narrow blades, should be employed and the cervix completely severed by four incisions at right-angles to each other. Experience has shown that if these cuts pass completely through the cervix that the tissues will not tear as the head emerges, but that dilatation will be instantly accomplished. Hemorrhage is slight, and the parts will heal without suture if antiseptic precautions are faithfully observed.

The question of immediate repair for laceration of the cervix has occasioned considerable discussion. It is undoubtedly true, that under antiseptic precautions tears of the cervix will heal without suture through the greater portion of their extent. Where, however, these tears are large and there are sufficient light and proper appliances at hand, there is no reason why such injury should not be repaired at once. The best suture-material is catgut or fine silk, and the continuous suture should be employed. The two lips of the cervix on the side of the tear should be drawn down and brought together, and clots having been carefully sponged out from between the torn edges, beginning at the upper end of the tear, a fully curved needle should be passed through the tissues and the end of the catgut firmly tied. The suture should be passed along the outer or peritoneal surface two-thirds of the way through the wall of the cervix. The tear should thus be brought together by over-and-over stitch until its outer extremity is reached. If antiseptic precautions are taken, a serviceable union should follow by first intention.

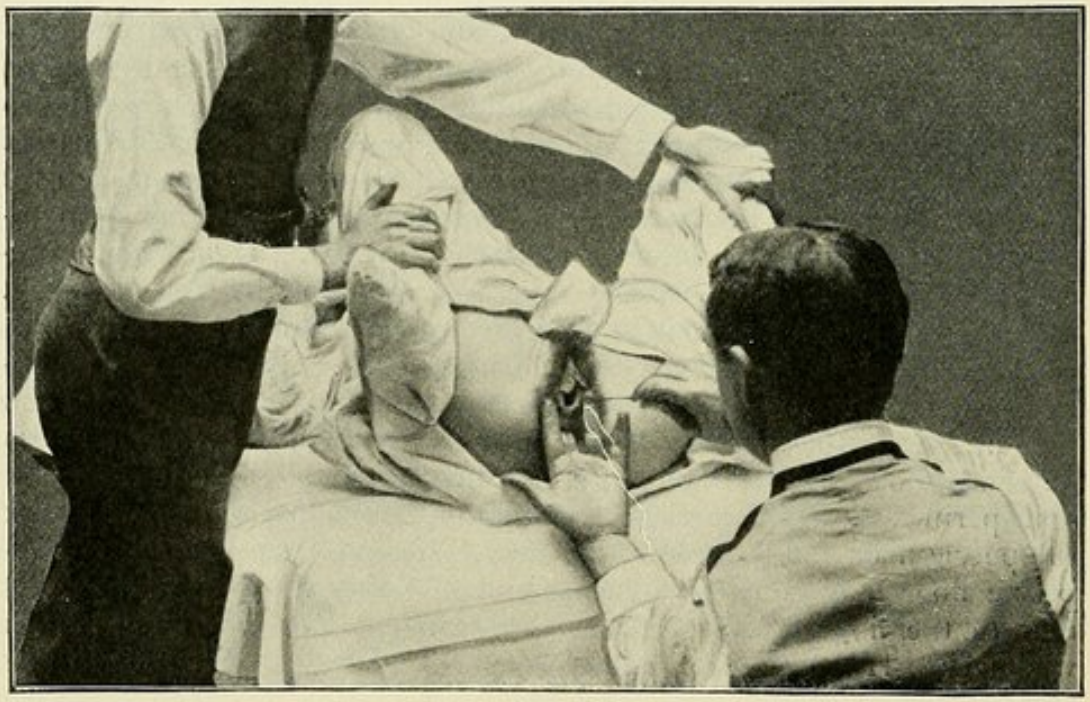
Suture of the pelvic floor and perineum is a simple procedure which is often done in a careless and inefficient manner. No one can understand this minor operation without remembering that in the case of a patient lying upon her back the posterior wall of the vagina at the outer third of its extent runs in a direction nearly at right-angles to the skin-perineum. If a careless examination be made in a case of tear of the pelvic floor and perineum, the torn surfaces on the two sides of the pelvic floor may become so firmly and smoothly filled with blood-clot that to the finger of the examiner there may seem to be no laceration whatever. If, however, the clots be sponged away, it will be seen that two furrows exist in the sulci, caused by laceration. If the examiner does not detect these tears upon the pelvic floor, his attention will be fixed upon the tear of the skin-perineum which accompanies the first. The latter can be readily closed by a few interrupted sutures, but there will be left above a pouch formed by the two tears in the sulci upon the pelvic floor, which as the tissues heal will cause a rectocele. It is evident that no suture of the pelvic floor and perineum can be complete which does not close both the torn surfaces. If the tears upon the pelvic floor be slight in extent, it is possible to close them by stitches passed through the skin-perineum with a fully curved needle, carrying the stitch upward and backward and taking it deeply to pick up the bottom of the tear in each sulcus. The stitches are finally brought out upon the opposite sides of the skin-perineum.

Where, however, the tears in the pelvic floor are large and it is impossible to close them completely from below, two lines of suture will be necessary. One should proceed along the posterior wall of the

vagina, closing the rent in the pelvic floor, and a second line of suture should be passed, which, beginning near the anus at the lower end of the skin-tear, proceeds upward, closing this portion of the laceration. The first line of suture should be continuous and the suture-material should be capable of absorption ; the second may be of interrupted stitches which may be readily removed.

To suture an extensive tear of the pelvic floor and perineum anæsthesia is required. In cases where the patient has been delivered under ether the placenta may be expressed, the vagina douched, and the suture begun and completed before the patient recovers from the anæsthesia. In cases where the patient was not delivered under ether the operator must be sure that the uterus is well contracted before anæsthetizing his patient to close the perineum. If, however, the uterus is

FIG. 151.

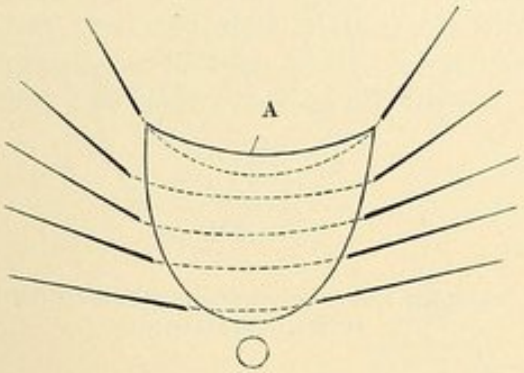


Closing an incomplete tear of the pelvic floor.

firm and there is no shock, ether may be given and the operation performed. The patient is placed upon her back, her hips projecting slightly over the edge of the bed or table, and good light should be thrown directly upon the part. Her limbs must be supported by assistance unless some form of leg-holder be used. A very simple device, which answers well, consists in taking a long sheet, folding it lengthwise several times, and passing it beneath the knees, drawing them well up, and then passing the sheet around the patient's neck. If properly adjusted, this will not interfere with her breathing and forms a convenient support. The operator will require sterilized linen with which to surround the field of operation. He will need an abundance of hot water, carbolic acid solution, 1 per cent., or creolin, bichloride of mercury solution, 1 : 4000. The instruments required are a needle-

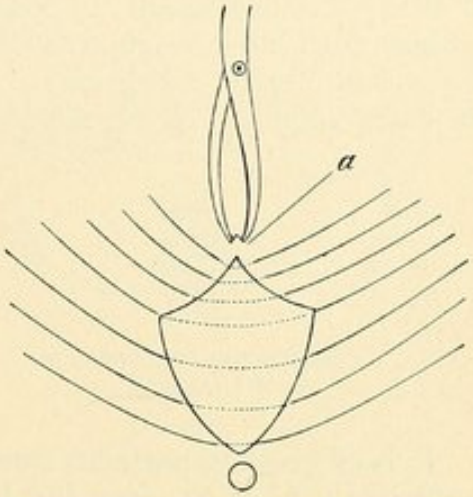
holder, several curved needles, preferably round, medium-sized; antiseptic catgut, medium and fine silk, silkworm-gut, blunt-pointed scissors curved upon the flat, several pairs of hæmostatic forceps; while in a few cases retractors are of service. The vagina and cervix should be thoroughly douched with carbolic acid or creolin solution. If there is oozing from tears in surfaces which are not sutured, the surfaces and

FIG. 152.



Torn surface and sutures in incomplete tear of perineum. (DÜHRSSEN.) A. vagina.

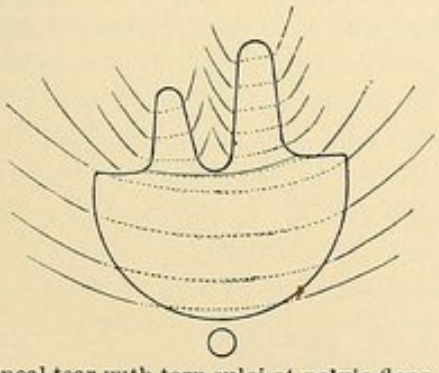
FIG. 153.



Forceps on highest point of incomplete tear. (DÜHRSSEN.) *a*. Sutures passed.

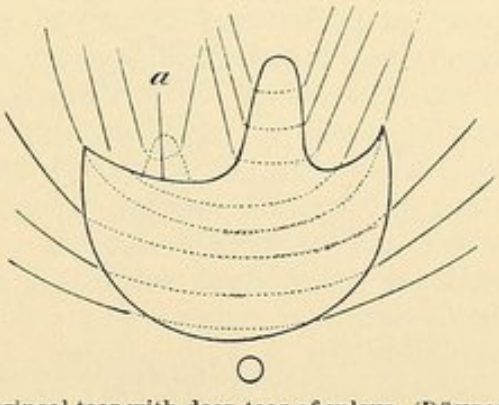
vagina above the laceration should be packed with iodoform-gauze. Two or three needles should be threaded with long suture of catgut or silk and laid upon a sterilized dry towel. The operator should turn his left hand with the palmar surface up and insert the longest finger of the hand into the rectum. He should then raise the tissues strongly,

FIG. 154.



Perineal tear with torn sulci of pelvic floor. (DÜHRSSEN.)

FIG. 155.



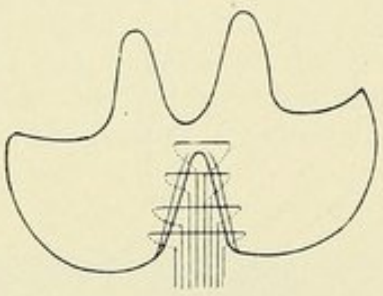
Perineal tear with deep tear of sulcus. (DÜHRSSEN. *a*. Vagina.

thus exposing the tears in the pelvic floor. These should be sponged out with antiseptic gauze and sutured with continuous catgut or silk from above downward.

In closing tears in the pelvic floor the operator should take care to avoid infecting the wounds by the finger which is inserted in the rectum.

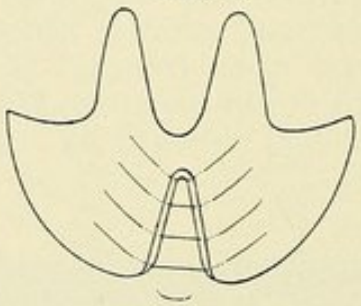
This finger need not be removed from the bowel until the sutures have been placed. The thumb and first finger of this hand are left free to grasp needles or sutures, and hence there is no reason for handling the sutures with the finger which has been in the rectum. When the stitches are all inserted the rectal finger should be removed from the bowel, thoroughly cleansed with bichloride solution, and the stitches should be tied.

FIG. 156.



Complete tear of pelvic floor. (DÜHRSSEN.)

FIG. 157.



Complete tear of pelvic floor, with interrupted suture. (DÜHRSSEN.)

It is of great importance that these lines of suture should commence sufficiently high to close the beginning of the tear. It is sometimes difficult to pass the needle sufficiently high to accomplish this, but the operator should persist in his efforts until he succeeds. The pelvic

FIG. 158.

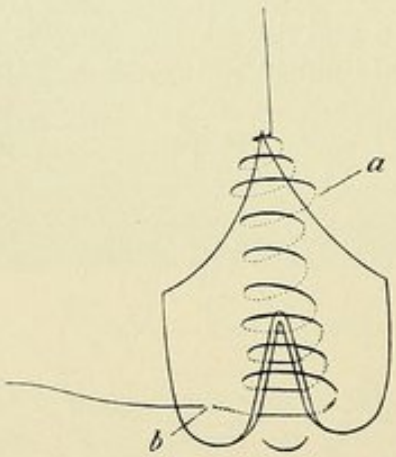
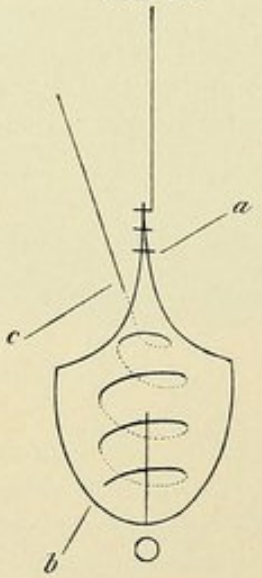


FIG. 159.



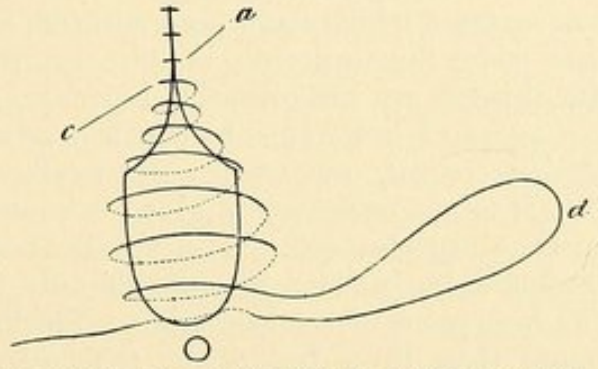
Complete tear with continuous suture. (DÜHRSSEN.)
a. Vaginal portion. *b*. Perineal portion. *c*. Buried suture.

floor should thus be closed with the continuous stitch to the end of the vaginal mucous membrane and to the beginning of the tear in the skin-perineum. If there be more than one tear, each should be sutured in this way.

When this is done the skin-laceration of the perineum should be closed with interrupted silkworm-gut, beginning from below and

proceeding upward to the end of the catgut stitch. If the laceration of the perineum be a deep one, the first stitch at the anus should be passed deeply, to include portions of the sphincter of the bowel, which may be injured. If the operator has good light and all needed articles in readiness, with his patient under ether, he can close an extensive injury to the pelvic floor and perineum rapidly and completely. If, however, his patient is not fully under control, if he does not understand clearly what he proposes to do, he will make an unsatisfactory suture and secure but a partial success. The finger of the left hand which is inserted in the rectum should not be afterward placed within the vagina, lest the wounded surface be infected. The finger should not touch needles or suture, as the thumb and index-finger of the same hand are left avaliable for that purpose.

FIG. 160.



Continuous suture (*a*) of sulcus, (*c*) of pelvic floor, (*d*) of perineum. (DÜHRSSEN.)

In cases of complete tear of the perineum and pelvic floor in which the rectum is opened the tear must first be made into an incomplete laceration by bringing together the torn edges of the rectal wall and the connective tissue which lies between the rectum and the vagina. This is to be accomplished by commencing at the highest point of the rectal wall and passing the stitches in such a manner as to turn the mucous membrane into the bowel. Such a laceration is best closed by continuous catgut suture from above downward. After the rectum has been restored the remainder of the laceration may be closed by passing interrupted stitches of silkworm-gut deeply through the tissues, beginning at the last rectal stitch and going upward through the posterior wall of the vagina. If the sphincter muscle of the bowel has been torn, it is especially important that the first stitch shall bring together its torn ends. If this is not possible by a single stitch, it is well to suture the laceration separately by several buried catgut or silk stitches and then to close the laceration with interrupted silkworm-gut stitches.

The after-treatment of cases of torn perineum in which suture has been done consists in keeping the bowels free from masses of hardened fæces. In cases of complete tear it is well to feed the patient for several days upon food which is largely absorbed in the stomach and which gives little or no residue. Such food is found in broths and soups, with a small amount of bread. The bowels should be moved in three or four days after labor. Straining may be avoided by giving the

patient calomel and soda in doses of one-tenth grain calomel every hour until a grain has been taken, and when the first inclination to a bowel-movement is felt a pint of warm olive oil should be very slowly and carefully injected into the bowels. If gas has formed in the intestine, a rectal tube should be passed as high as possible to permit the escape of the gas, while the oil may be injected through the tube. As soon as the bowels move the rectum should be gently douched with warm water, and the stitches should be carefully irrigated with bichloride solution, 1 : 10,000, and powdered with boric acid. In cases of incomplete laceration in which sutures have been taken the bowels should be opened as soon as possible after delivery and should be kept open daily.

The care of the stitches in these cases is a matter of great importance, as good union depends upon the absence of infection. It is better not to use bichloride of mercury in any but very weak solutions in repeated applications upon surfaces which have been sutured, as union is apt to be not so perfect as when this antiseptic is not employed. The preferable antiseptics for this use are carbolic acid, 1 per cent.; boric acid, one tablespoonful to a quart of hot water, to which may be added a tablespoonful of glycerin; creolin, one teaspoonful to the quart; lysol; or thymol, 1 : 1000. It is not necessary to give a copious vaginal douche whenever the stitches are cleansed. The nozzle of the tube from a fountain-syringe should be inserted far enough only to carry the fluid just beyond the highest point of the laceration. The bag of the syringe should not be more than three feet above the patient's head. As a rule, the stitches should be cleansed every four hours during the day and every six hours during the night. After douching the surfaces they should be freely powdered with boric acid, or in hospital practice iodoform may be employed.

The use of the catheter is unnecessary in these cases, but the parts about the urethra and anus and the stitches must be thoroughly cleansed after each micturition and defecation. It can usually be so arranged that the patient shall empty the bladder at regular intervals and thus avoid unnecessary disturbance to cleanse the stitches.

It is especially important in these cases that an antiseptic occlusion-dressing be worn over the vulva. If this be done and the nurse practise antiseptic precautions regarding the cleansing of her hands and every detail about the patient, good union usually results. In estimating the amount of repair obtained it should be remembered that the parts are never in precisely the same condition after childbirth as was formerly the case. The orifice of the vulva is always more open in women who have borne children, and at first sight it may seem as if a serious laceration still remained. In estimating the patient's condition after recovery from laceration of the perineum the physician must examine the pelvic floor and observe its firmness, the absence of depressions and deep sulci in these tissues. If the uterus be found in a good position and the pelvic floor firm, elastic, and not bulging or sagging, it is of no importance that the opening of the vulva be larger than before labor and that the walls of the vagina are not in absolute contact at its opening.

It was formerly thought to be necessary to bind the knees of the patient who had a laceration closely together during her convalescence. This, however, is now known to be unnecessary, and such restriction is only needed while the patient is coming out from the influence of ether or in women who are especially restless and unruly. As regards the time for removing the stitches, it is frequently seen that the stitches are drawn so tightly that the edges of the tissues are made to ulcerate in the skin. If, however, such be not the case, silkworm-gut stitches may be left for two weeks, while catgut need not be, of course, removed. It is often found advantageous to leave silkworm-gut stitches long, gathering the ends of all the stitches into a single knot when the operation is completed. If the ends of the stitches be then carried upward on one side into the patient's groin and the occlusion-dressing be applied, but little discomfort will follow. Stitches so treated may readily be removed without untying the knot.

To remove the stitches the patient should lie upon her back or side in a good light. The operator requires a pair of long-handled, blunt-pointed scissors, while some prefer probe-pointed angular scissors for this purpose. If the knots are buried in the mucous membrane, this should be pushed aside with a grooved director, which may be passed beneath the stitch to serve as a guide. The scissors may then be placed in the groove of the director and the stitches easily severed in this manner. In using silkworm-gut it is essential that no part of the stitch be left, for it will not absorb, but will remain as an irritating, foreign body. It is often advantageous to grasp one portion of the stitch with hæmostatic forceps and to make gentle traction upon the knot before cutting it.

Should septic infection occur in the stitches the parts will be red and swollen and pus will exude from about the stitches. In these cases all hope of union must be abandoned. The stitches must be promptly removed and the parts allowed to gape open. The raw surfaces should be thoroughly disinfected with strong bichloride solution, 1 : 500, or creolin, or tincture of iodine. The injury must be repaired when the patient recovers from her septic infection by a secondary operation.

In cases where the physician does not see his patient until some time after labor it is interesting to consider whether in such a case union may be obtainable if stitches are not immediately taken after delivery. As a rule, if the parts be thoroughly cleansed and the tissues be rubbed with gauze or scraped with the edge of a scissor-blade until they ooze and bleed, union may be obtained by first intention at any time during the first twenty-four hours after labor. If the parts are in good condition, the torn surfaces may be scraped with a curette and united by stitches during the first three or four days after labor, with good result. It is sometimes asserted that union will take place in such cases without the use of stitches. If the limbs be kept tightly bound together and the parts be maintained in a thoroughly clean condition, it is possible that partial union might occur. It is, however, so very improbable that complete and sound union will follow that there is no excuse for

depending upon this belief to secure union. In cases where the patient is severely shocked at the time of labor it is not wise to suture the pelvic floor if partial anæsthesia will be required. It is usually possible to give a patient an anæsthetic during the first twenty-four hours after labor and then close the lacerated surfaces.

In nervous and excitable patients in whom stitches have been taken through the skin a condition of excitement and straining may develop when the effect of the anæsthetic passes off, which may threaten to tear asunder the sutured tissues. This complication should be treated by a rectal suppository of aqueous extract of opium $\frac{1}{2}$ grain, extract belladonna $\frac{1}{4}$ grain, iodoform 1 grain, and sufficient cocoa-butter to make the suppository.

CHAPTER II.

THE FORCEPS.

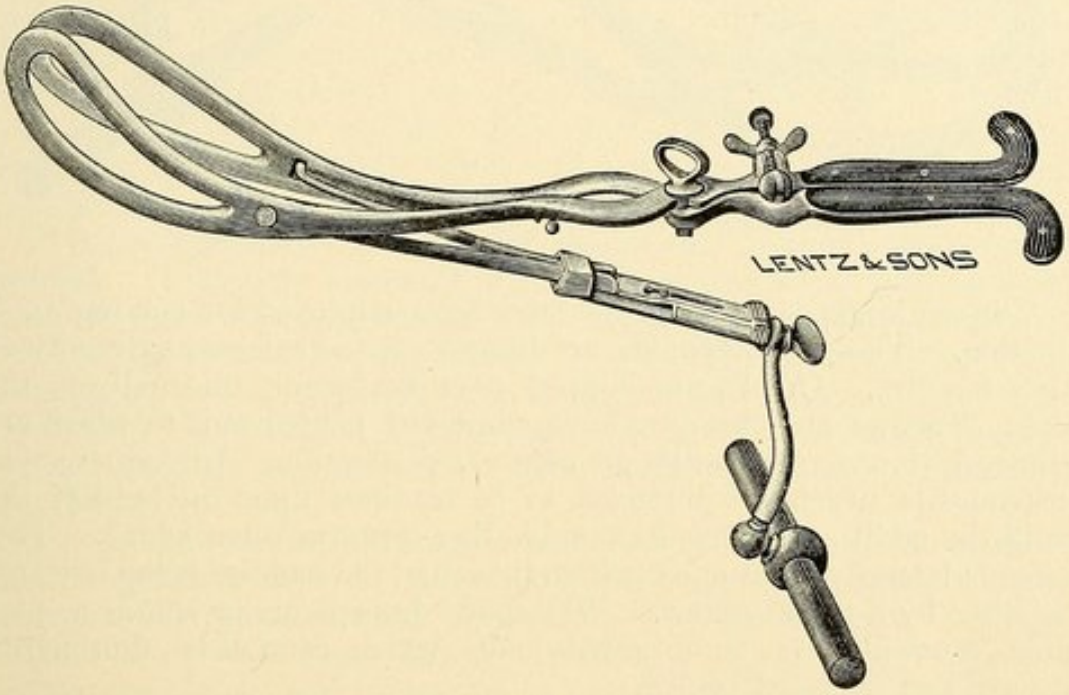
By the obstetric forceps is understood an instrument resembling a pair of hands, composed of two portions, crossing one upon the other and fastened together by a lock. The origin of the obstetric forceps seems to have been in separate sharp hooks which were used to extract a dead fœtus. The effort of Chamberlin, of England, to keep the instrument a secret for his own profit is familiar to all interested in the literature of obstetrics. Various obstetricians have modified the forceps and changed its model.

In later times obstetric forceps have been modelled after one of two patterns—one that of Tarnier and the other of Simpson. At present no obstetric forceps meets the requirements for which the practitioner depends upon the instrument which is not fitted to make traction in the axis of the pelvis—to make axis-traction.

Each blade of the forceps is composed of three portions—a concave, expanded part of the instrument, which resembles the flexed hand and which is called, because it fits upon the head of the child, the cephalic portion. At the outer extremity of each blade is the portion grasped in the hands of the physician, and called the handle; between these two parts is the remainder of the blade, called the shank, upon which is found the lock. The two blades of the forceps are named right and left, in accordance with the portions of the mother's pelvis at which each is applied; thus, the left blade of the forceps, which is inserted first, is passed along the left side of the mother's pelvis. It should also be grasped in the left hand of the physician for insertion. The right blade is that which is applied upon the right side of the pelvis, lying uppermost upon the left blade, and is grasped in the right hand of the operator. In most forceps the cephalic portion contains an oval opening, known as the fenestra. This is shaped differently in different

forceps, varying chiefly in width. There are two sorts of locks commonly employed upon the forceps. That found upon Simpson's consists in a groove upon the lower or left blade, into which fits a ledge formed by cutting in the upper or right blade. This lock is most easy to bring together, but does not keep the blades in close apposition, and requires constant pressure or traction upon the forceps to maintain the blades in a locked condition. The French lock consists of a screw upon the lower or left blade terminating in a thumb-piece. Upon the upper or right blade is a notch into which the screw is fitted. The handles of well-made forceps are of steel, nickel-plated, or of hard rubber, moulded, while hot, upon the handles and smoothly polished.

FIG. 161.



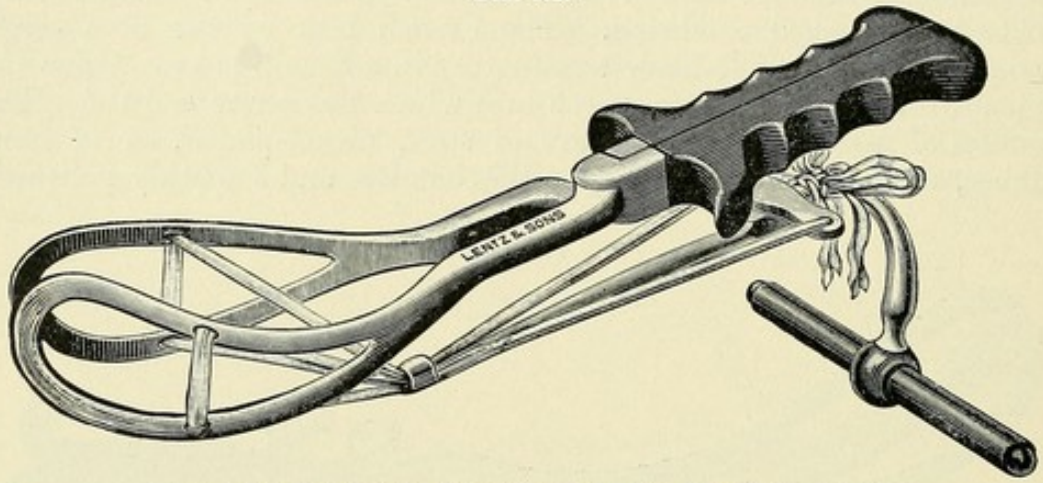
Tarnier's forceps.

Well-made forceps are sufficiently heavy to prevent springing or bending of the blades; they must be perfectly smooth and heavily nickel-plated to prevent corrosion. Forceps vary in length from ten to fourteen inches, and also in weight, depending upon the use of metal or rubber in the handles and also the weight or lightness of the instrument. As a rule, heavy forceps are better than light, because the danger of bending is not present and because in skilful hands less force is needed to perform extraction than with the light instrument.

Various devices have been employed to secure axis-traction. The simplest of these consists in a stout cord or tape which is passed over the forceps at the shank near the lock, while traction is made downward upon this cord. The same result is obtained by passing the cord or tape through the fenestræ in one or both of the blades, and thus making traction upon the cephalic portion of the blade. A better use of the tape, devised by Poullet, consists in boring holes through the

edges of the fenestræ and passing the tape through these holes, as shown in the accompanying illustration. A simple method consists in perforating the forceps blade just externally to the fenestra and passing the tapes through these apertures.

Fig. 162.



Simpson's orceps, fitted by the author with tapes and traction-bar.

Various kinds of metal hooks have been employed for making axis-traction. Those of Reynolds are inserted at the external extremity of each fenestra. Others are slipped over the shank internally to the lock. Tarnier and Simpson have employed jointed rods to which are attached transverse handles to secure axis-traction. In axis-traction instruments which are intended to be clamped upon the head of the child, in addition to the lock a binding-screw is often added. This extends laterally from one blade to the other, the handles being brought together by a thumb-screw. Well-made forceps are as simple as possible, containing no complicated joints which cannot be thoroughly cleaned and rendered aseptic.

Forceps are designed usually with one of two objects. In most cases the obstetrician endeavors to apply the instrument to the sides of the child's head. This requires an instrument whose blades are especially adapted to fit over the fœtal head. When the blades are joined the handles will be found close together, while the shanks are thus brought one above the other. In forceps which may be applied to the sides of the pelvis and not closely fitted to the sides of the child's head, the blades do not fit so perfectly over the head, the handles are not closely approximated, while the shanks are considerably further apart. Although various modifications of these two types of forceps have been made, they have been of little importance except to publish the name of the person making the modification.

The function of the forceps is to make traction only. It is not to be used as a lever, nor as a rotater, nor as an instrument to crush a fœtal head.

The indications for application of the forceps are danger to mother or child or to both by reason of delay in delivery. Certain conditions

must be present to make the use of the forceps possible, and unless these conditions are at hand the forceps becomes a very fatal and dangerous instrument to mother and child.

It is absolutely necessary for the successful use of forceps that the fœtus and the pelvis be proportionate in size. No greater mistake can be made than the endeavor to use the instrument in cases where the child is too large to pass through the pelvis. The practical test to determine this fact is the presence or absence of engagement of the head. If thorough examination under anæsthesia, if needed, shows that the head has not begun to engage, an effort must be made to bring this about by pressing the head downward and backward above the pelvic brim. Engagement can sometimes be effected in this way, aided by Walcher's position. If the head be not engaged, and if it does not engage with good labor-pains and judicious manipulation, the use of the forceps is absolutely forbidden. In all cases which have not been measured by a pelvimeter pelvimetry should be practised, if possible, before the forceps is applied. Information of great value may often be gained by this procedure, which will assist the physician in performing delivery.

It is also necessary for the use of forceps that the head or the breech present. It is rarely necessary to apply forceps to the breech, although it can be done with good result. The membranes must have ruptured, and the cervix must be fully dilated or sufficiently opened to admit the instrument, and so elastic as to be easily dilated. The position of the head must be favorable for delivery. It is rarely necessary to apply forceps when the face presents or when the occiput has not rotated to the front.

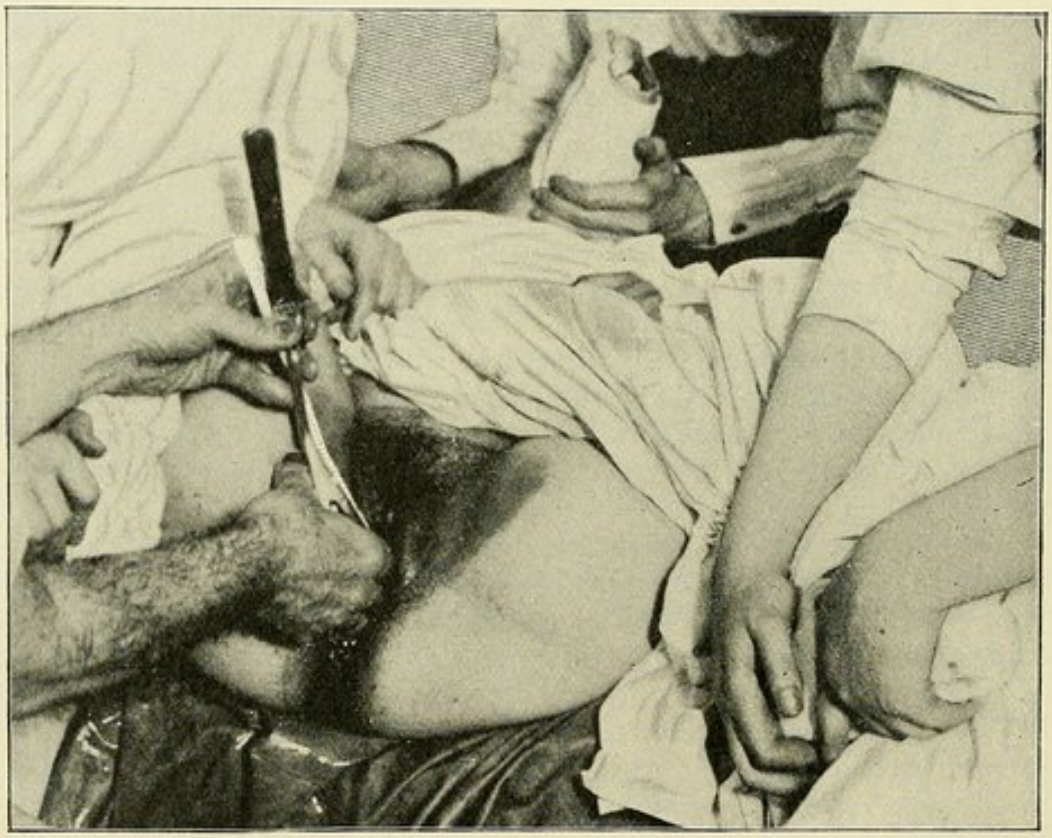
The positive indications for the use of the forceps are the mother's failure to deliver herself. Good judgment is often required to determine whether the mother can or cannot accomplish delivery. The practitioner must review the factors necessary to the accomplishment of spontaneous labor, and endeavor to supply those which are lacking before using forceps. He is not, however, to wait until exhaustion is present, as this error is quite as dangerous as the unnecessary use of the forceps. The signs and symptoms that the mother cannot deliver herself are progressive failure of uterine contractions, which do not improve by giving the mother rest under obstetric anæsthesia or with the administration of quinine or stimulants. The mother's general aspect must be that of fatigue and inability for muscular exertion. It is unwise to wait until the mother's pulse is so rapid as to indicate shock. It is also unwise to wait until the vagina and pelvic floor are without the usual secretion of mucus or are swollen from the effect of pressure. It will be remembered that in normal labor the head advances and recedes slightly with each pain. When, however, the head does not recede, but remains fixed after several pains, this furnishes a valuable indication for artificial delivery.

The fact that the child is in danger, demanding instrumental delivery, is ascertained by noting the rate of the fœtal heart-beat, which becomes either more rapid and weak or slower and weaker than the

average. Violent fœtal movements sometimes indicate danger to the child, as they are often caused by beginning asphyxia. Discharge of meconium indicates threatened danger to the child.

In preparing to use the forceps it is unnecessary to frighten the mother by an exhibition of the instrument or by the statement that an operation is to be performed. In the case of primiparæ ether should be given, and an anæsthetic is needed in all cases except those in multiparæ, in whom the parts are easily dilated. It is best to tell the mother that she will require assistance for her own good and that of the child, and that if she will take ether she will suffer no pain. Whenever it

FIG. 163.



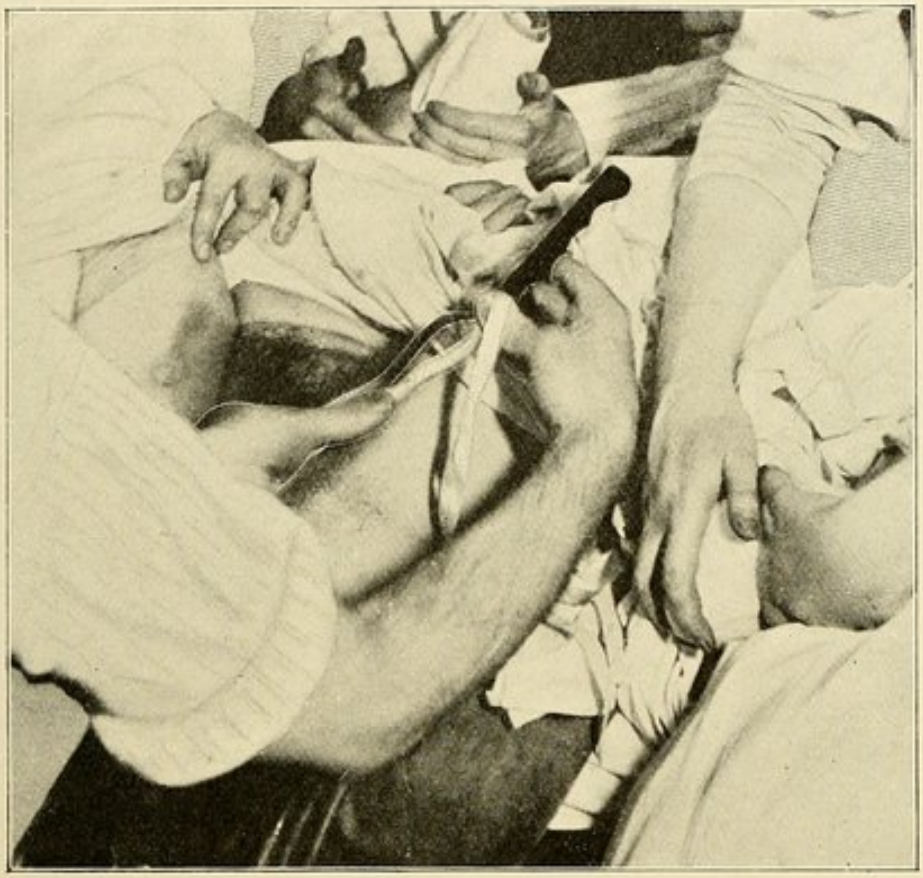
Applying left blade of forceps, head on pelvic floor.

is possible the services of a physician should be obtained to administer the anæsthetic. If a skilful, trained nurse be present who has been trained to give anæsthetics, she may assume this duty. The operator will need, beside his forceps, several pairs of hæmostatic forceps, a needle-holder, curved needles, suture-material, blunt-pointed scissors, and a probe-pointed bistoury, or blunt-pointed, straight scissors if episiotomy be needed. Antiseptic solutions, hot water, ergot, stimulants, strychnine, and antiseptic gauze must also be at hand. The forceps should be prepared by washing them thoroughly in soap and hot water and rinsing them in scalding or boiling water for ten minutes, then placing them in a thoroughly clean toilet pitcher filled with creolin

or carbolic acid, 2 per cent.; a towel may then be placed over the pitcher and the instruments thus kept from view. There should also be in readiness an infant's bathtub and abundance of hot water.

The vagina must be thoroughly douched with carbolic acid or creolin, 2 per cent. The external parts should be washed with soap and hot water, douched with simple water, and then with bichloride of mercury solution, 1 : 2000, or with creolin, 2 per cent. The rectum must be thoroughly emptied by injection and the bladder by catheter.

FIG. 164.

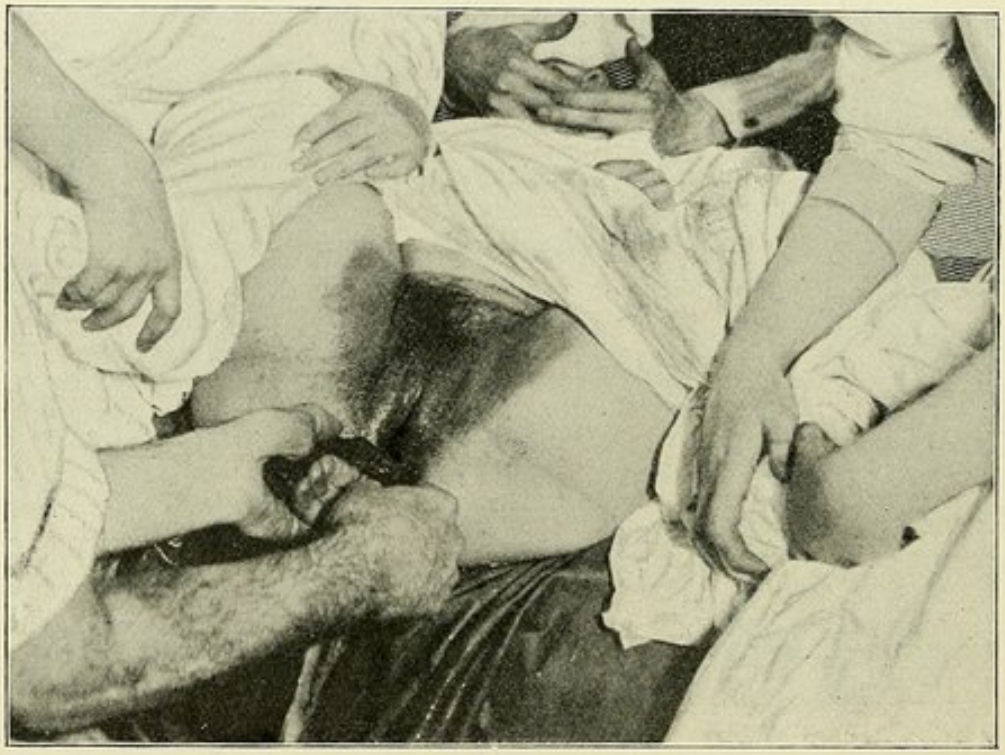


Applying right blade of forceps, head on pelvic floor.

It is usual to place the patient on her back at the edge of a bed or table. Where, however, it is necessary to apply the forceps high in the pelvis it is sometimes advantageous to turn the patient upon her left side, as the operator can then make traction better downward and backward. If assistants are present, they must support the limbs, which are flexed upon the pelvis. If there are few helpers, the limbs may be kept up by a sheet around the patient's neck or they may be placed in chairs. When the patient is sufficiently anæsthetized the physician should introduce all the fingers of the antiseptic hand with which he proposes to make an examination, using sufficient of the hand to palpate the head distinctly. He must study carefully its position and degree of engagement and whether the head seems of unusual size and hardness.

In the simplest cases, in which rotation has occurred, while the head remains upon the pelvic floor, the forceps is to be applied straight in the pelvis, the blades upon the sides of the child's head. Before applying the instrument the physician, having thoroughly cleansed his hands, must introduce the right hand sufficiently far so that the hand is hidden in the vagina as far as the thumb. The right hand should pass to the left side of the mother's pelvis, between the head and the pelvis. The left blade of the forceps must then be grasped about its middle by the left hand of the physician, in such a manner that it balances easily in the hand. The blade should then be held parallel to Poupart's ligament of the right side, the cephalic portion of the blade passing along the concavity of the right hand of the operator. The lower border of

FIG 165.



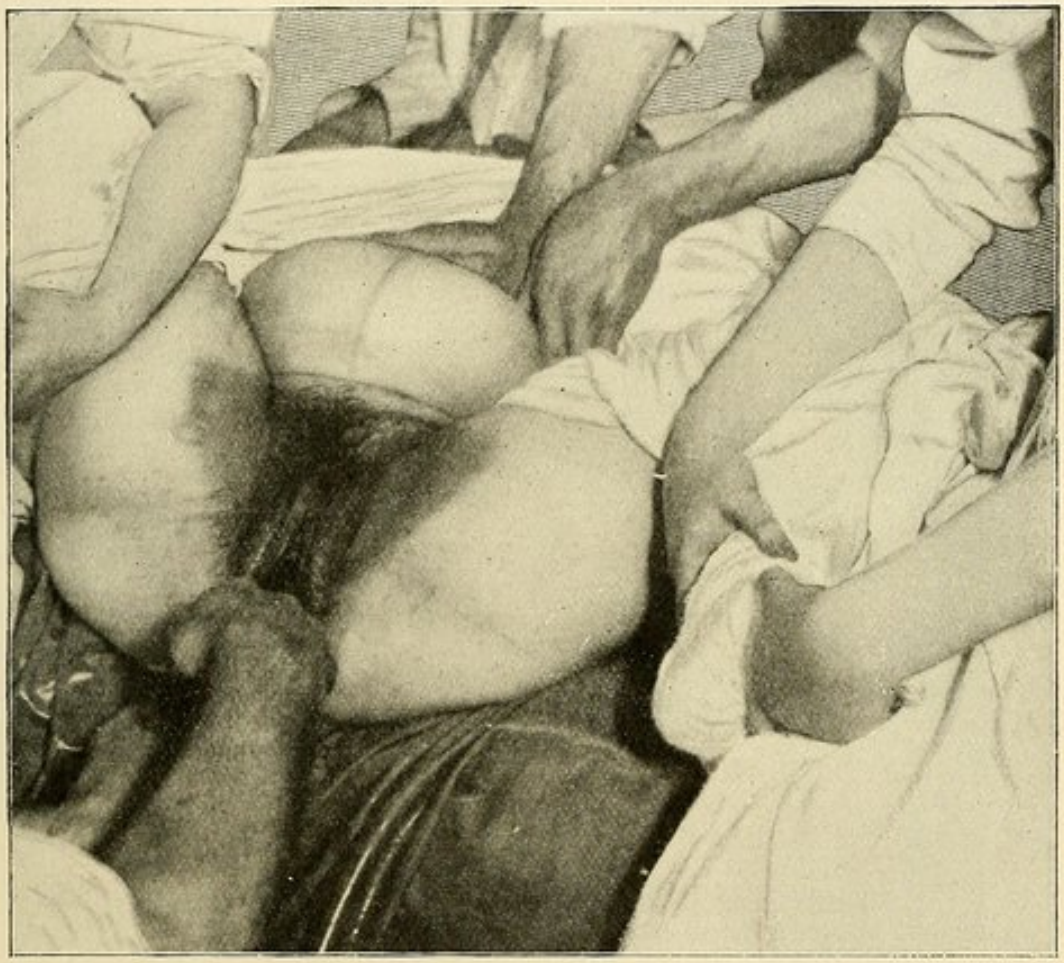
Locking the forceps, head on pelvic floor.

the cephalic portion of the blade should ride upon the thumb of the right hand and may be guided by the thumb. If the blade is skilfully applied, by simply dropping the handle, it will glide easily to its place. The left hand of the operator should then be inserted upon the right side of the mother's pelvis, the right blade grasped by the right hand of the operator, held parallel to Poupart's ligament of the left side, and inserted in the manner described. During the insertion of the right blade it will be necessary to depress the handle of the left blade to give the operator room. When the blade has been inserted a careful examination should be made to be sure that the blades are grasping only the head. The forceps should lock easily, and if this is not the case they have not been applied to the sides of the head. Should this

occur, the blades must be unlocked and slightly shifted until it is found that they have been properly applied.

Traction should be made with the pains, and if uterine contractions have ceased, it is well to rub the uterus and bring them on before making traction with the forceps. In simple cases in which the head has descended and rotated, traction should be made downward and backward until the occiput begins to appear beneath the pubic arch. When the vertex is well within the vulva the head should be cautiously raised, so that the face of the child passes over the perineum. If the

FIG. 166.



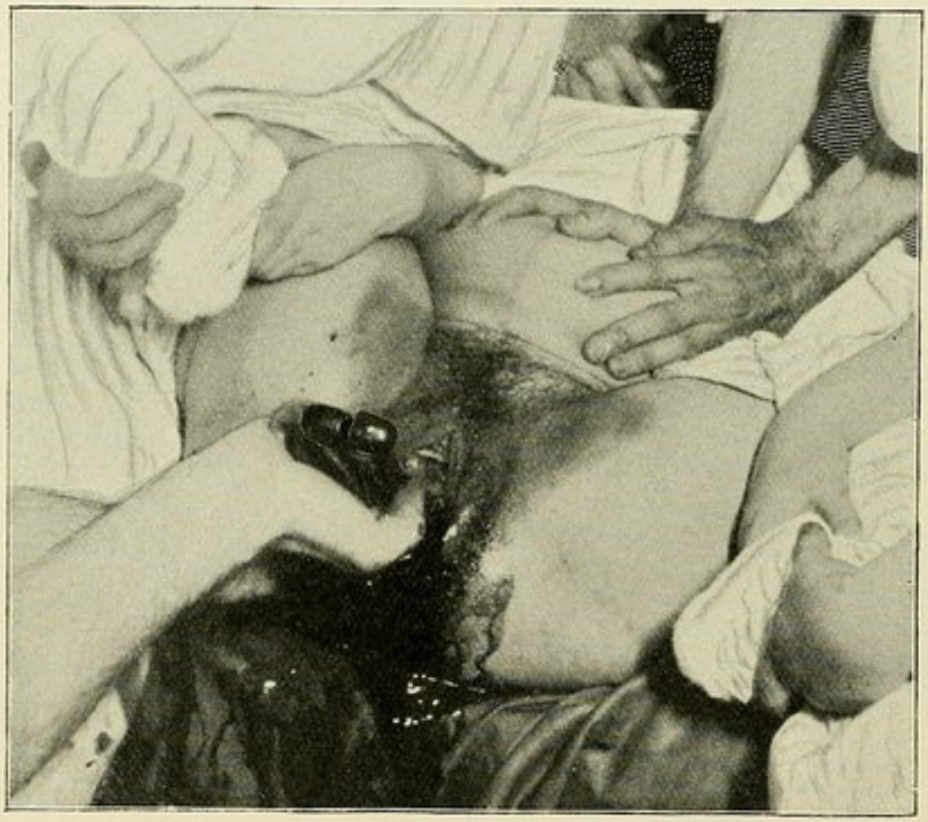
Traction downward and backward, head on pelvic floor.

operator observes that a tear of the perineum is inevitable, it may often be prevented by episiotomy. It is sometimes well to remove the instrument when the vertex has been brought well within the vulva. By rubbing the uterus and pressing downward upon the fundus it is often possible to secure the expulsion of the child without the forceps. Unless, however, every condition is favorable for such a birth, it is best to retain the forceps upon the head and to complete the birth of the head with instruments.

Some operators think that less danger of laceration exists if the head is expelled spontaneously from the vagina and pelvic floor. More time

is given for the parts to dilate if spontaneous expulsion is awaited, and thus the normal mechanism of labor is more closely imitated. If, however, the fœtal heart-sounds have been very rapid or slower than is normal, if the birth has been prolonged, and if the child has been delayed for some time in the birth-canal of the mother, the danger to the fœtus will be much less if the head is extracted with forceps. The mother is better protected also by forceps delivery, because less danger of relaxation of the uterus and post-partum bleeding exists. Complete flexion is better maintained with forceps than without, while the mechanism of dilatation can be secured more perfectly with the instrument than by waiting for the imperfect uterine contractions of an exhausted patient in delayed labor. Unless the prospects are good for very speedy expulsion of the child, the safer plan is to complete the labor with the forceps.

FIG. 167.



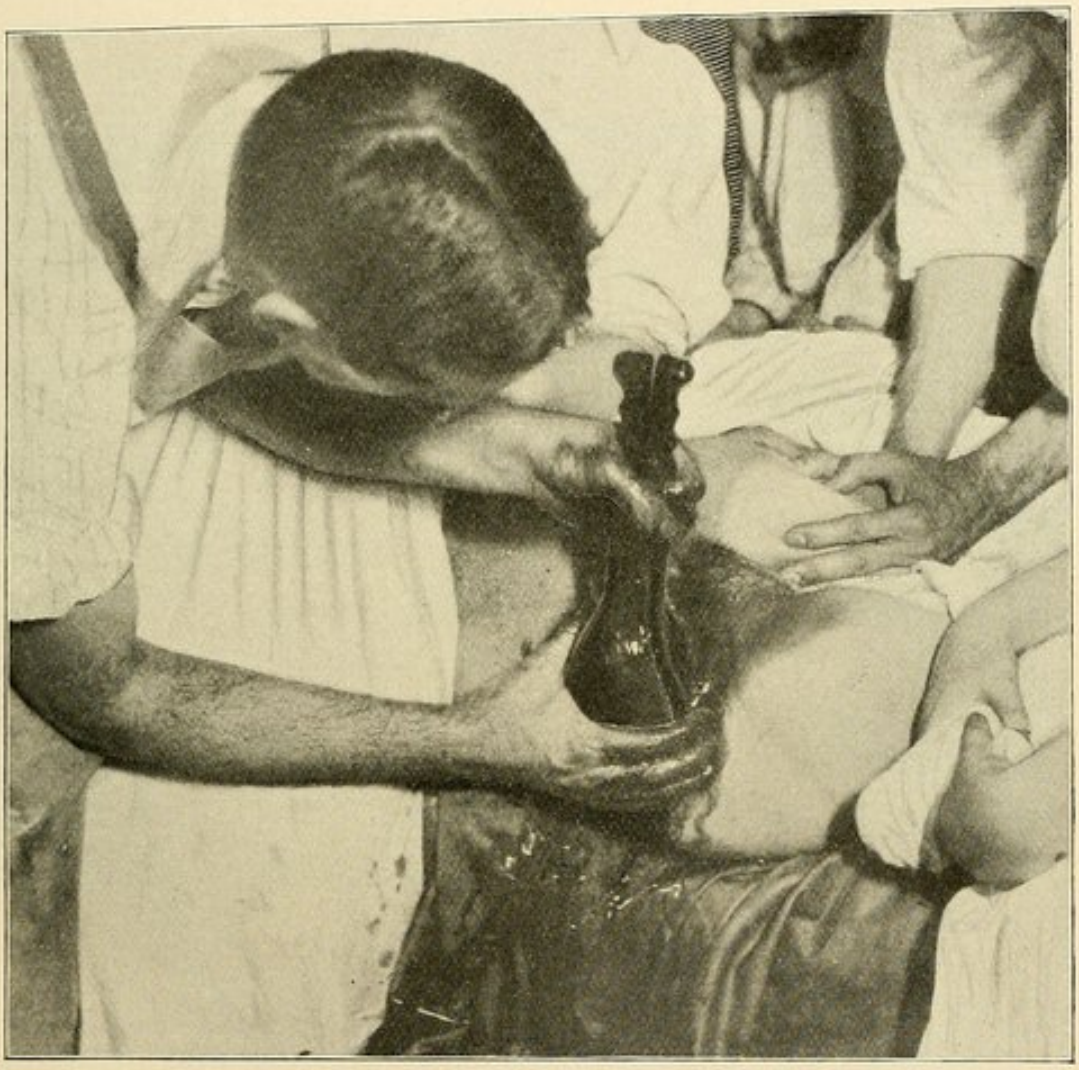
Bringing occiput closely under pubes, head on pelvic floor.

The mortality for mothers and children in forceps deliveries, where the head is upon the pelvic floor and has rotated, under antiseptic precautions is practically *nil*. Delivery may have been delayed so long that the child may have perished from asphyxia before the forceps were applied, but in such a case the use of the instrument cannot be blamed for the death of the child. The morbidity of these cases for the mother consists in the lacerations which the haste and careless use of the instrument may cause. Should these tears become infected, puerperal sepsis may produce a high rate of morbidity. If reasonable care be exercised in applying the forceps, the child should not be injured in these cases.

If the instrument be not applied to the sides of the child's head, and if the head be strongly compressed, intracranial hemorrhage may follow with fatal result.

The use of forceps is also demanded in cases in which the head has entered the pelvic brim, but has ceased to descend upon the pelvic floor. These cases are often seen in poorly developed primiparæ whose muscular and nervous strength becomes exhausted early in the second stage of labor. In these patients the head stands obliquely in the pelvis, usually occupying with its occipito-frontal diameter the right oblique

FIG. 168.



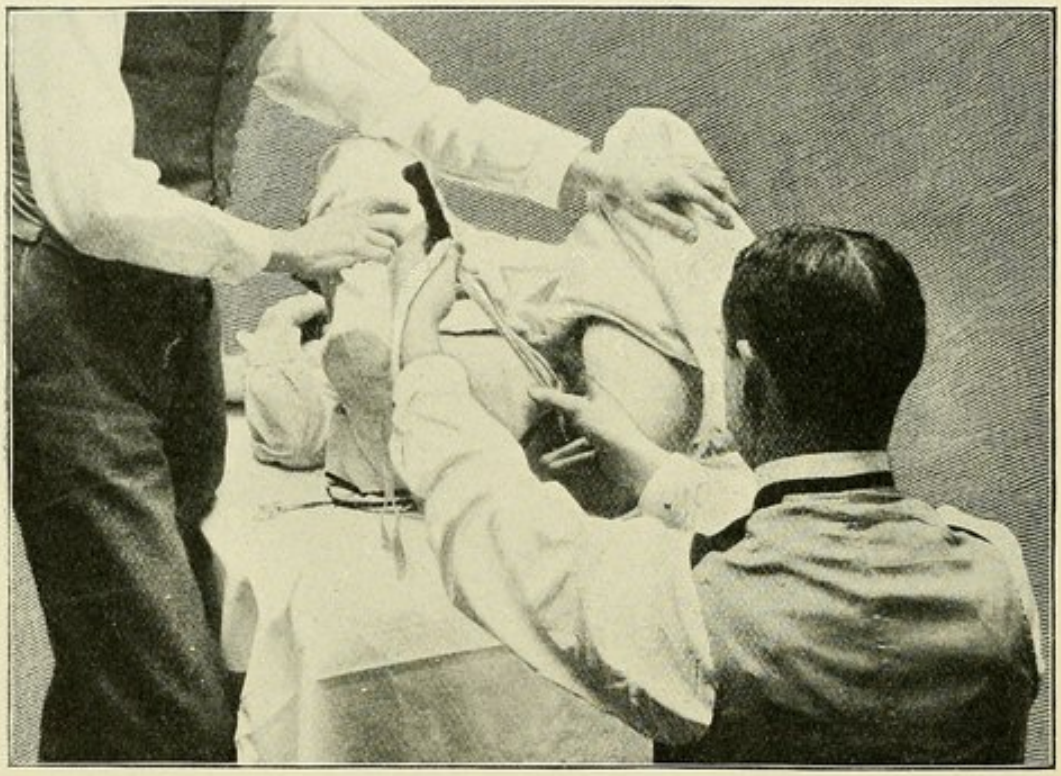
Delivering the head with forceps.

diameter of the pelvis. It is evident that the forceps must be applied obliquely in the pelvis to fit accurately upon the child's head. In deciding to apply forceps care must be taken to make a positive diagnosis regarding the position of the head. It is well to prepare the forceps for use and to anæsthetize the patient completely with ether. A thorough examination should then be made, and sufficient of the hand introduced to palpate the head clearly. If it be found that the head has passed the pelvic brim, but remains obliquely above the pelvic

floor, the forceps should be applied to the sides of the child's head, flexion maintained by axis-traction, and delivery effected by allowing the head and the forceps to rotate together upon the pelvic floor.

None but axis-traction forceps are suitable for delivery in these cases. The forceps are antisepticized as already described, and the patient brought to the edge of the bed or table with her hips projecting over the edge. The operator should be free to pass the hand upward and backward, and this requires that the elbow be dropped. The patient's hips should project sufficiently over the bed or table to allow this to take place readily. The right hand should first be introduced and passed sufficiently high to palpate the head thoroughly. The left

FIG. 169.

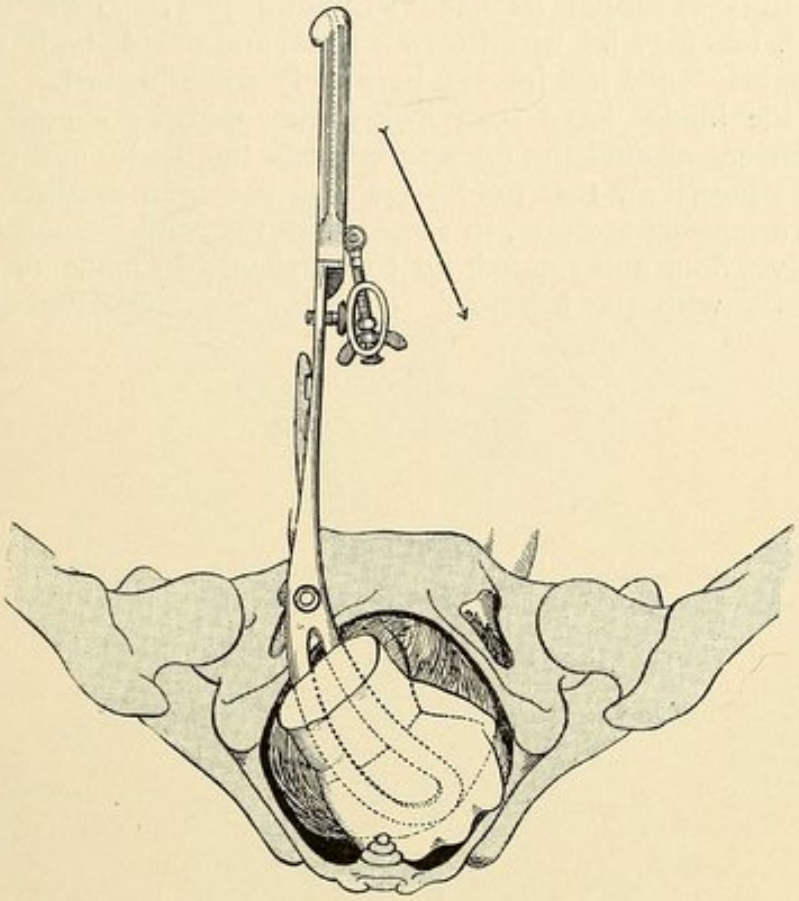


Commencing high introduction of forceps.

blade of the forceps should be first inserted, entering the vagina with its antero-posterior diameter corresponding with the antero-posterior diameter of the vulva, and as the blade is carried higher it should be rotated gently to fit upon the child's head. In the most usual cases, that of delay in labor with the occiput presenting in the first position before rotation has occurred, the left blade of the forceps will rotate in such a manner that the anterior surface of the lock will point obliquely upward and outward toward the inner aspect of the mother's left thigh. When this blade has been introduced it should be held in its proper position and the handle gently depressed to make room for the introduction of the right blade. It is more difficult to introduce the right blade, and greater patience and time are usually required. It should

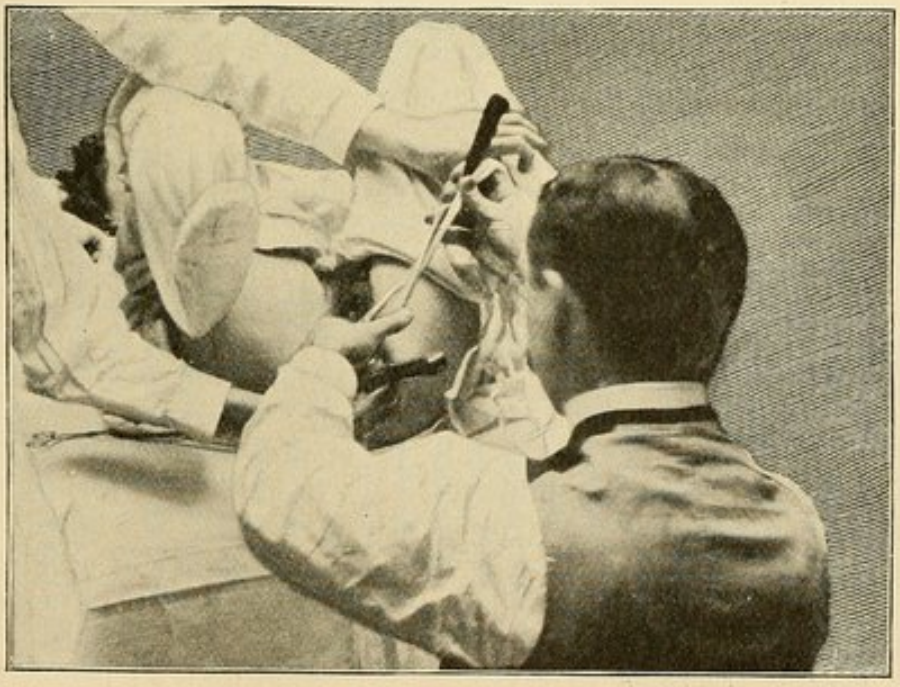
be introduced first from the left, and made to rotate gently from left to right until it passes over the side of the child's head and locks with

FIG. 170.



Guiding hand and forceps blade, high application. (FARABOEUF and VARNIER.)

FIG. 171.

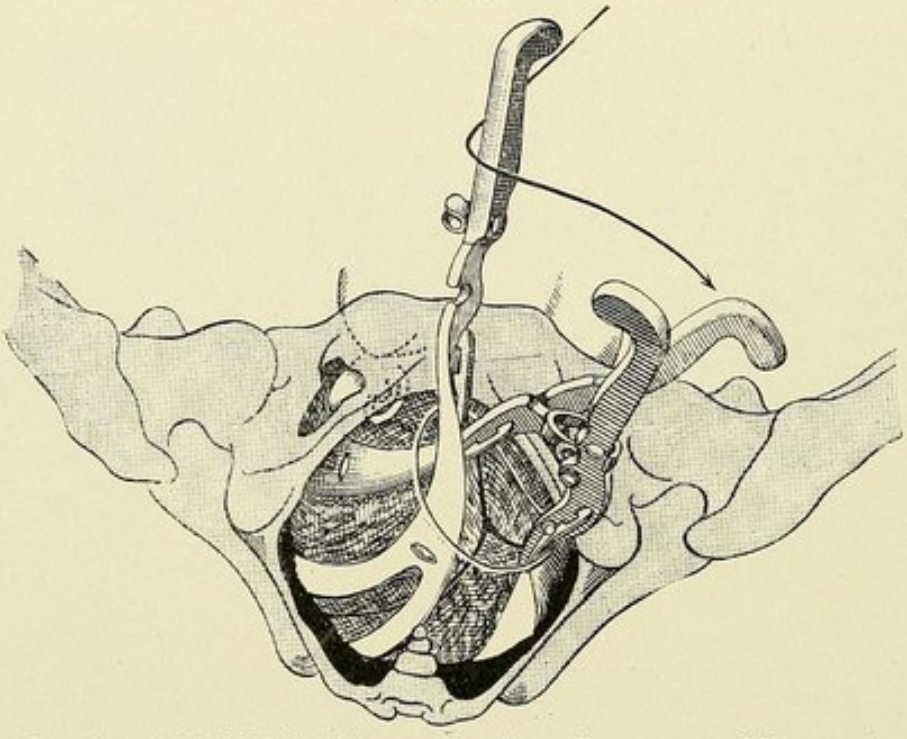


Commencing high introduction of right blade.

the left blade. It is often necessary to spend several minutes in carefully adjusting the forceps in locking. Unless the forceps locks easily and smoothly, the blades are not applied accurately to the sides of the head and traction cannot be made without injury. If the blades are not locked, one may be withdrawn a little, and one or both should be rotated slightly until locking can be readily accomplished.

When the blades have been locked the operator should carefully pass the fingers around the forceps, between the blades and the cervix, to ascertain positively that the forceps has not been applied upon the cervix. In making traction, in cases where the head has not descended to the pelvic floor and rotated, no effort should be made to rotate the head directly with the forceps. If traction be made downward and

FIG. 172.

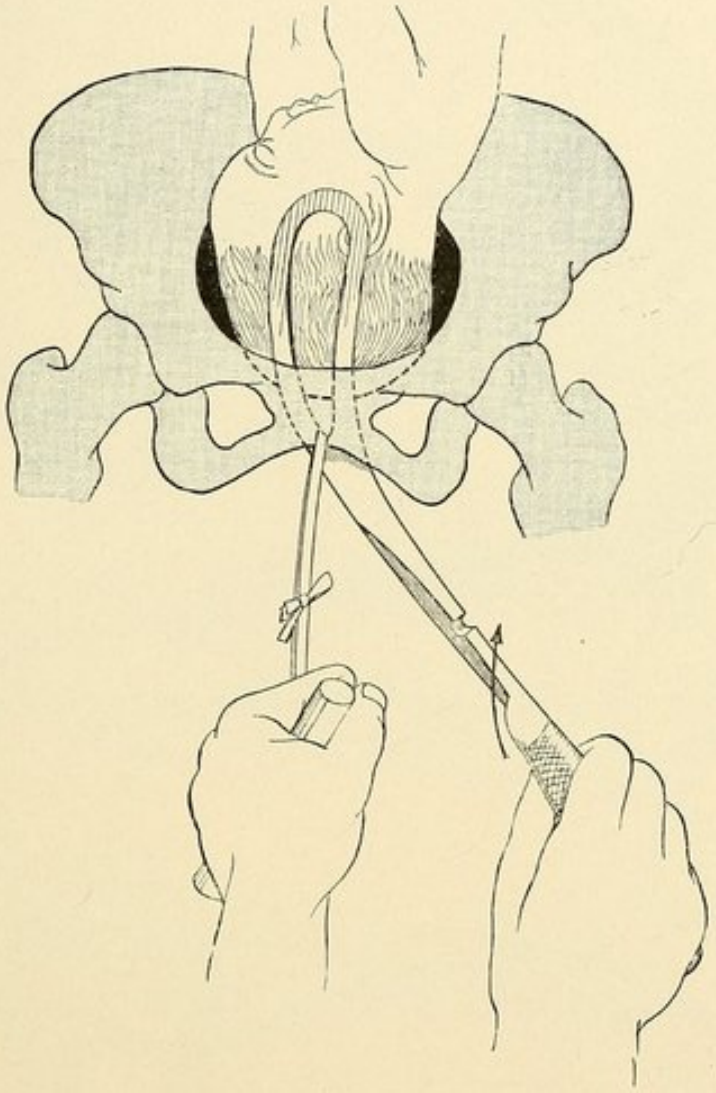


Rotation of right blade in oblique application. (FARABOEUF and VARNIER.)

backward and toward the centre of the pelvic cavity, the head and the forceps will descend and rotate in the manner desired. If Simpson's forceps be used, it is well, during the descent of the head, to relax the grasp of the blades from time to time, to prevent injurious pressure upon the head. It was formerly advised that the forceps should be used as a lever to pry the head from its oblique position. It was sought to accomplish the same object by traction from side to side upon the forceps after the manner of a pendulum. It was also advised in some cases to rotate the head forcibly by turning it in the grasp of the forceps. These procedures, however, have been entirely abandoned by good operators since the use of axis-traction forceps has become thoroughly understood and widely practised. The operator should remember that he must not expect delivery to take place so readily as when the head was upon the pelvic floor. If flexion is not complete, it will require several tractions to establish this condition, so necessary for

delivery. It is much better to practise gentle traction for some time, allowing the head to mould and the birth-canal to dilate, than to extract the head by sudden and forcible delivery. If the patient be under ether and in good hands, there will be less danger of postpartum bleeding and relaxation of the uterus if she be delivered without haste.

FIG. 173.

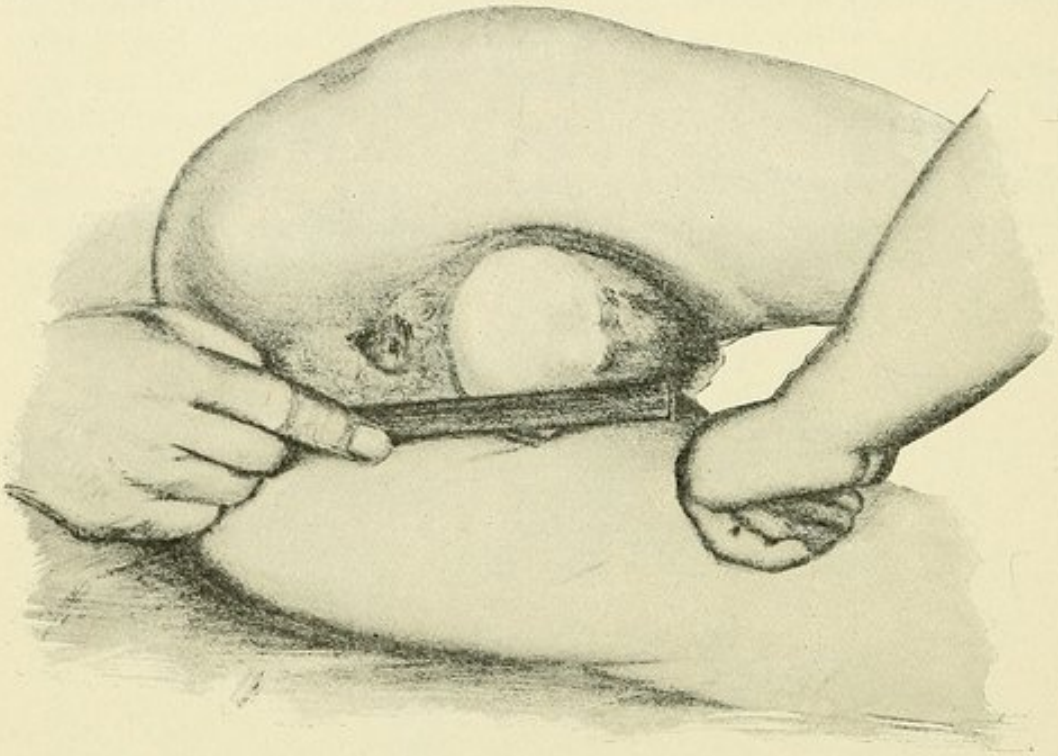


Axis-traction, forceps to sides of head. (FARABOEUF and VARNIER.)

In prolonged deliveries with forceps it is very important that the uterus, as it grows smaller by the gradual expulsion of the child, should be followed down in the abdomen by the hand of the operator or an assistant. Before traction is made with the forceps the uterus should be gently rubbed to bring about at least a tonic condition of the uterine muscle. Pressure should be made upon the fundus during traction of the forceps, and absolute relaxation of the uterus should be, if possible, prevented. The passage of the head through the pelvis will be considerably aided by this procedure, and especially the engagement and descent of the shoulders, which are considerably under the control of the operator by external manipulation.

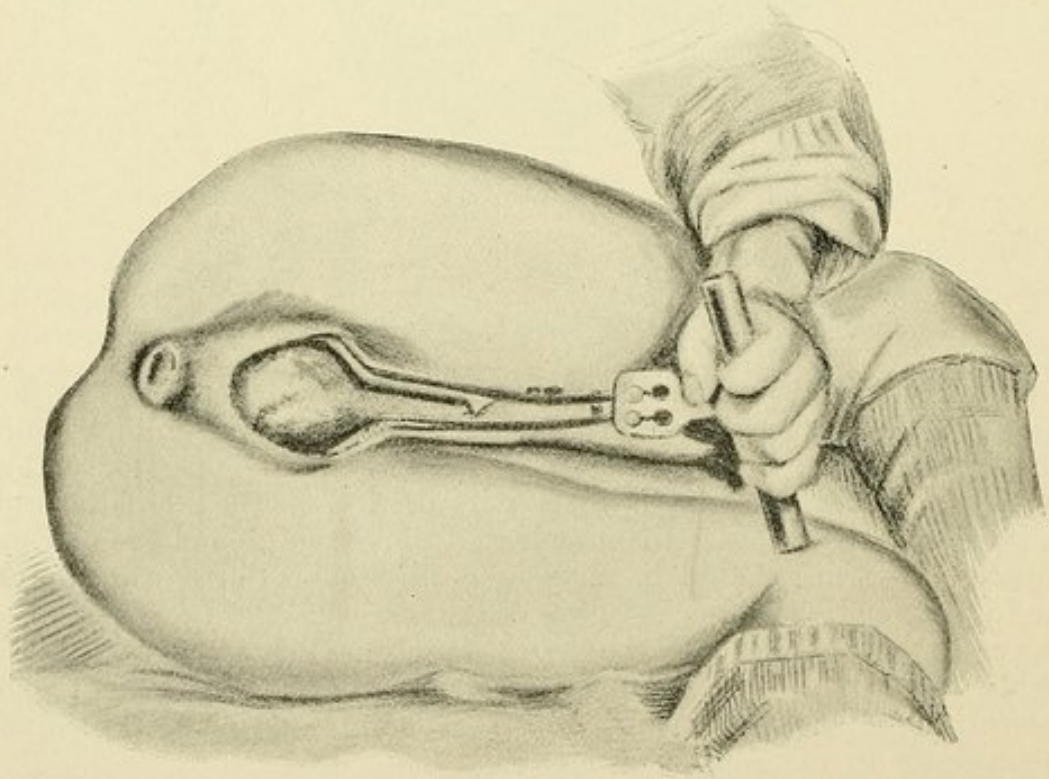
In cases where the womb is kept suitably contracted during forceps delivery the placenta is often expelled at the moment of birth or is found in the vagina immediately after.

FIG. 174.



Head passing perineum normally. The posterior hand holds rule for measurement. (HART.)

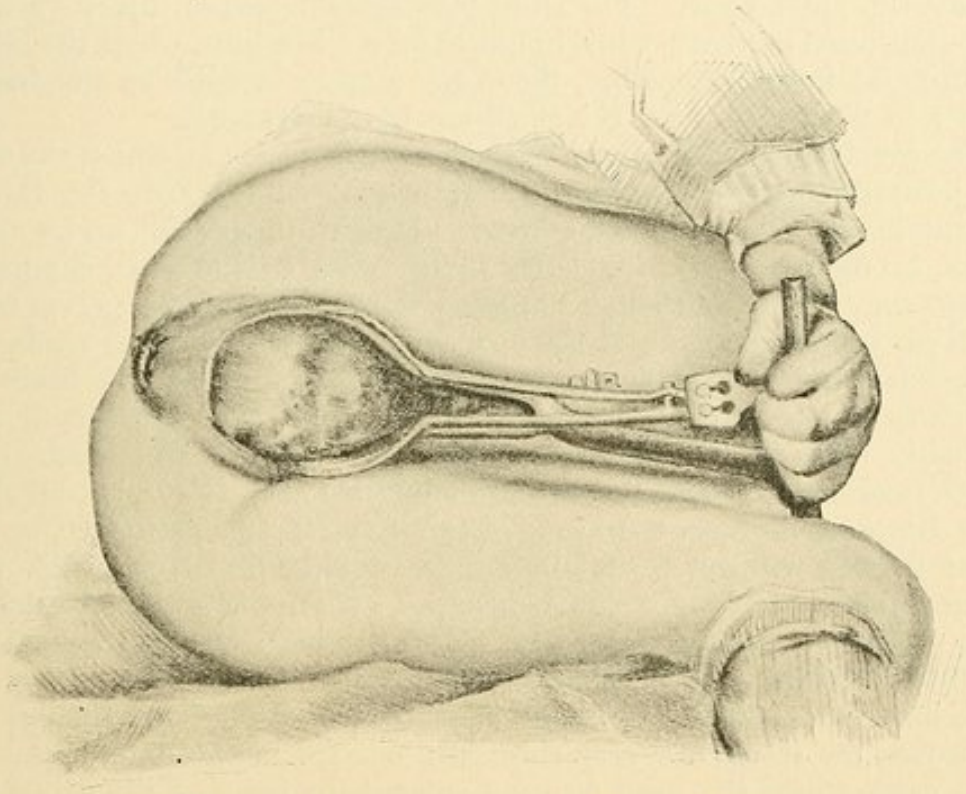
FIG. 175.



Head on perineum, forceps delivery, patient on her right side. (HART.)

One of the greatest dangers in these cases is from relaxation of the uterus and postpartum bleeding. This can be prevented by making traction with labor-pains, by not emptying the uterus rapidly, and by the prompt administration of ergot and strychnine. As soon as the uterus is emptied, if laceration occurs, the parts should be sutured in the manner already described. It should be remembered that in these cases there is also the danger of secondary relaxation and postpartum bleeding. If the patient is not in the hands of a competent nurse, a physician should remain with her or should see her again in a few hours after labor, unless there should be that most important sign of uterine relaxation and bleeding, which is found in the rapidity and feebleness of the pulse, when he must not leave until all danger has

FIG. 176.



Head distending perineum, forceps delivery. (HART.)

passed. It is possible for a large clot to form in the cervix and effectually dam up the cervical canal so that no blood may escape through the vagina. If the abdominal binder has been applied, it is not so easy to determine the size of the uterus; and as no blood escapes through the vagina in such a case, the patient may suffer severe internal hemorrhage with relaxation of the uterus, when the only appreciable sign of this condition is to be found in the rapidity of the pulse. The nurse or attendant should be carefully instructed, after cases of prolonged delivery by forceps in weak patients, to look out for relaxation and hemorrhage, and, if the pulse be carefully watched and no abdominal binder be applied for the first twenty-four hours, but the womb kept well contracted by massage, these dangers may be avoided.

The application of the forceps to the head situated at the upper portion of the pelvic cavity is sometimes termed the high application of the forceps. It requires in these cases more skill and patience to apply the instrument successfully and to effect delivery than is needed when the head is upon the pelvic floor. If suitable instruments be used and thorough antisepsis be practised, the mortality-rate for mothers is not increased by this method of delivery. More children are lost than when the head is lower in the pelvis, because the danger of pressure is greater through the prolonged application of the instrument and the oblique position of the head. The morbidity-rate of oblique forceps application is considerable for the mother if she be in unskilful hands. Laceration of the cervix often results from too hasty delivery in these cases. The pelvic floor and perineum may also be torn. If axis-traction be not practised, the cervix may be bruised by forcing it against the pubic bone. The child may sustain severe injury through long-continued pressure, while in unskilful applications, where the blades are brought forcibly together, the scalp may be bruised by the instrument ; in unskilful hands the skull has been fractured.

The practitioner will occasionally meet with cases in which the head had partially rotated, but in which it is impossible to fit the forceps accurately upon the sides of the head. If, with the patient under anæsthesia, he fails to apply the blades to the sides of the head, Simpson's forceps may be introduced and applied to the sides of the pelvis without regard to the position of the head. If gentle traction be made and the grasp of the forceps be relaxed between each traction, the head will gradually rotate within the forceps blades and the instrument will gradually come to fit accurately upon the sides of the head. The blades must not be locked closely, but just sufficiently to prevent them from slipping off from the head. Axis-traction is imperative, as the object desired will not be obtained unless this be practised. This procedure, unless carefully conducted, exposes the fœtus to greater danger from pressure, because the blades grasp the head irregularly and are not fitted accurately to the sides of the head.

If, however, patience and gentleness in this use of the forceps are employed, the result is a very successful one for mother and child.

In cases where the head has not entered the brim of the pelvis and cannot be made to enter by suprapubic pressure, supplemented by suitable posture, the application of the forceps is positively contraindicated.

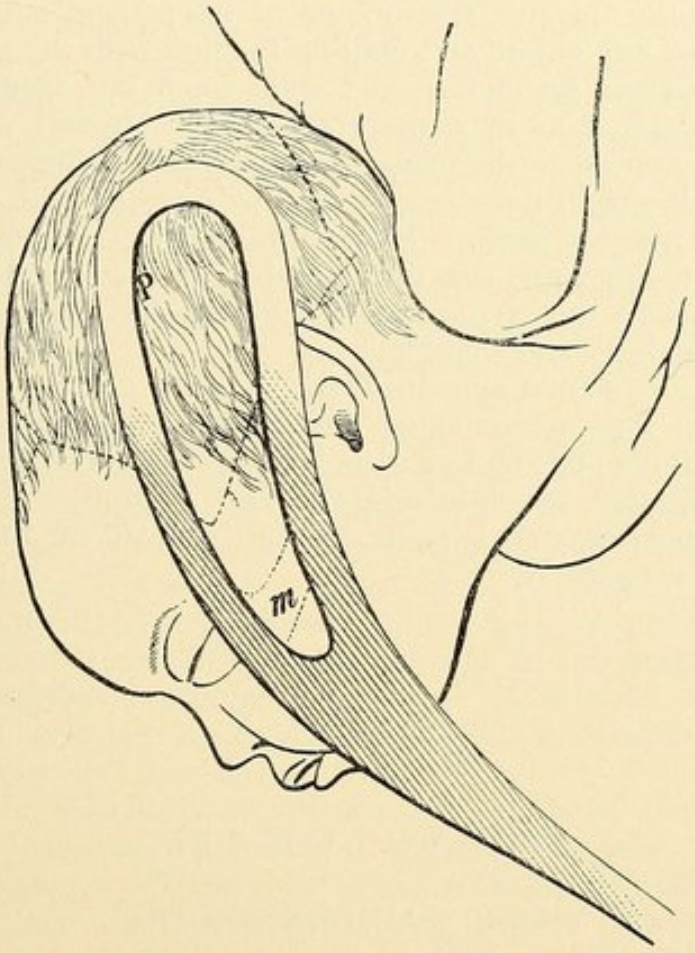
The use of the forceps in cases of defective rotation of the occiput, in which the cervix tends to rotate posteriorly, is usually conducted most successfully when Simpson's forceps are applied to the sides of the pelvis and axis-traction practised, the blades being relaxed between each traction. If care and patience be exercised, the mortality- and morbidity-rate for the mother and child are not increased by the use of the instrument in these cases. Its function, however, is that of traction only.

Rotation is effected in these cases not alone by the forceps, but principally by the pelvic floor and the walls of the pelvic cavity. The function of the forceps is to make traction only, interrupting this traction and allowing the head gradually to accommodate itself to the birth-canal. Rotation in these cases is very gradually accomplished, and is

frequently not complete until the head has come down into the pelvic floor and has remained there for some time. In cases where the pelvic floor is deficient in strength and elasticity rotation may be delayed until the head reaches the bottom of the pelvic cavity and enters the vagina.

The use of the forceps in face presentations is rare. It is occasionally necessary to apply a narrow-bladed instrument to the sides of the face, bringing the chin down upon the pelvic floor. Axis-traction is a positive necessity in this case, as otherwise the chin may partially ascend and the head become impacted.

FIG. 177.



Forceps to the sides of the head in face presentation. (FARABOEUF and VARNIER.)

The application of the forceps to the breech, while not commonly practised, is a useful expedient and not injurious to mother or child. The blades should be so applied that the centre of the fenestra of each blade should correspond to the centre of each trochanter. Axis-traction forceps may be clamped upon the body of the child and the forceps and the breech be brought to descend together.

The forceps may not infrequently be used as a valuable means of preventing laceration of the pelvic floor and perineum. Where labor-pains are strong and sudden, if the patient be anæsthetized with ether and the forceps applied, the operator can often control the head in its passage through the vulva to great advantage. By raising or lowering

the handles he can produce complete flexion or extension and the parts be gradually and efficiently dilated as the head emerges.

In undertaking a prolonged and difficult delivery with forceps the operator should secure the assistance of a competent person to whom the giving of an anæsthetic and the watching of the patient may be left entirely. This is most important, as deep anæsthesia and carelessness may bring on relaxation of the uterus and postpartum hemorrhage. As the child is in greater danger than normal from asphyxia, appliances for resuscitation should always be in readiness. The use of the instrument should be based entirely upon accurate knowledge and skill in manipulation. No greater force should be used than that which is exerted when the operator sits in front of his patient, without bracing himself against any object, and making traction with the arms only; it is highly dangerous for mother and child when the operator uses extreme force or when, as in some rare cases, the strength of more than one person is applied to the forceps. It has been estimated that a force of fifty pounds weight may be applied in pulling upon the forceps without injury in average cases. This approximates very nearly the force exercised by the operator who does not brace himself against the bed, but relies entirely upon the strength of his forearms, aided by the muscles of the back and shoulders.

In using axis-traction appliances the simplest are most satisfactory. Tapes furnish a most convenient and efficient appliance, and, if linen tape be used, there is no danger of breaking. Fresh tape should be used for each application, which insures asepsis. Complicated traction bars and rods require especial care, as they are difficult of application and hard to cleanse properly.

CHAPTER III.

VERSION AND EXTRACTION.

By version is understood the turning of the fœtus in such a manner as to bring its longest axis parallel with the axis of the pelvis. This may be done by external manipulation only, by external and internal manipulation combined, and by introducing the hand within the uterus.

The indications for version are a transverse and oblique position of the fœtus, an abnormality in the shape of the pelvis, such as simple flattening of the pelvis, or a pressing indication for rapid delivery which can best be accomplished by extraction by the breech and feet. The choice of version or forceps depends upon the presentation, the forceps being usually indicated in cases of vertex presentation, and also upon the shape and size of the pelvis, and the degree of dilatation in the os and cervix which is present.

External version is performed by manipulating the fœtus through

the abdominal wall. It is usually impossible to accomplish this if the membranes have ruptured and if much of the amniotic liquid has escaped. If labor-pains are strong, it is impossible to perform external version unless the patient be deeply anæsthetized. She should be placed upon her back with her hips slightly raised ; her thighs should be flexed. If there are no active uterine contractions and the patient is not nervous, the use of an anæsthetic may not be required. If, however, manipulation excites pain and causes distress, chloroform should be given to mild anæsthesia. The operator will map out the fœtus carefully and decide accurately upon the manner and direction in which he wishes to turn the child. One extremity of the fœtus which it is desired to dislodge from the pelvic brim should be carried gently upward with one hand, while with the other the other extremity of the child should be brought downward to the entrance of the pelvis and pressure made as gently as possible, and at intervals, to avoid exciting contractions of the womb and of the abdominal muscles.

When external version is accomplished, if the patient is not in active labor, an effort may be made to maintain the fœtus in the desired position until labor-pains begin. Two rolls of soft material, but of considerable firmness, may be laid upon the abdomen, one on each side of the fœtus, and bandaged firmly in this position. If sufficient dilatation is present to warrant the step, the membranes may be ruptured, when the fœtus will gradually enter the brim of the pelvis and remain in the desired position. External version is only possible in cases where the membranes are not ruptured, or where but little amniotic liquid has elapsed, and where also the abdominal muscles and the uterus are not firm and resisting, but relaxed and flexible. If ordinary precaution be observed, the effort to perform version in this manner will do the child and mother no harm ; while if the attempt be successful, the mother will be spared the annoyance and danger of internal manipulation. If rashly and carelessly attempted, it is possible to separate the placenta, causing bleeding and the death of the child.

By combined version is understood the turning of the fœtus within the womb by external manipulation, aided by internal methods also. As this method was advocated by Braxton Hicks, it is often spoken of as Braxton Hicks's method of performing version. It consists in introducing one hand within the vagina sufficiently far to pass several fingers through the os and cervix, so that the presenting part can be pushed upward by the internal hand. The other hand is employed in raising the body of the child by pressing upon it through the abdominal wall, and by pushing it upward and in the opposite direction from that in which the internal hand endeavors to carry the presenting part. This method of version is often employed in cases of partial placenta prævia and in cases of brow and face presentation.

To perform this manipulation the patient is placed upon her back at the edge of a bed or table, her hips projecting over the edge. The bladder should be emptied by catheter, and, if the patient is sensitive, she should be partially or wholly anæsthetized, preferably with chloroform. The vagina should be thoroughly douched with creolin or carbolic acid, 2 per cent., and the hands and arms of the operator be made completely

aseptic. The operator should then introduce the fingers of one hand within the cervix and the head or breech be carried upward and slightly forward. The external hand may first be placed behind the symphysis upon the shoulder of the child, assisting to carry the fœtus upward above the pelvic brim. When this has been accomplished the external hand should carry the other extremity of the fœtal body downward, bringing it, if possible, to engage in the brim of the pelvis.

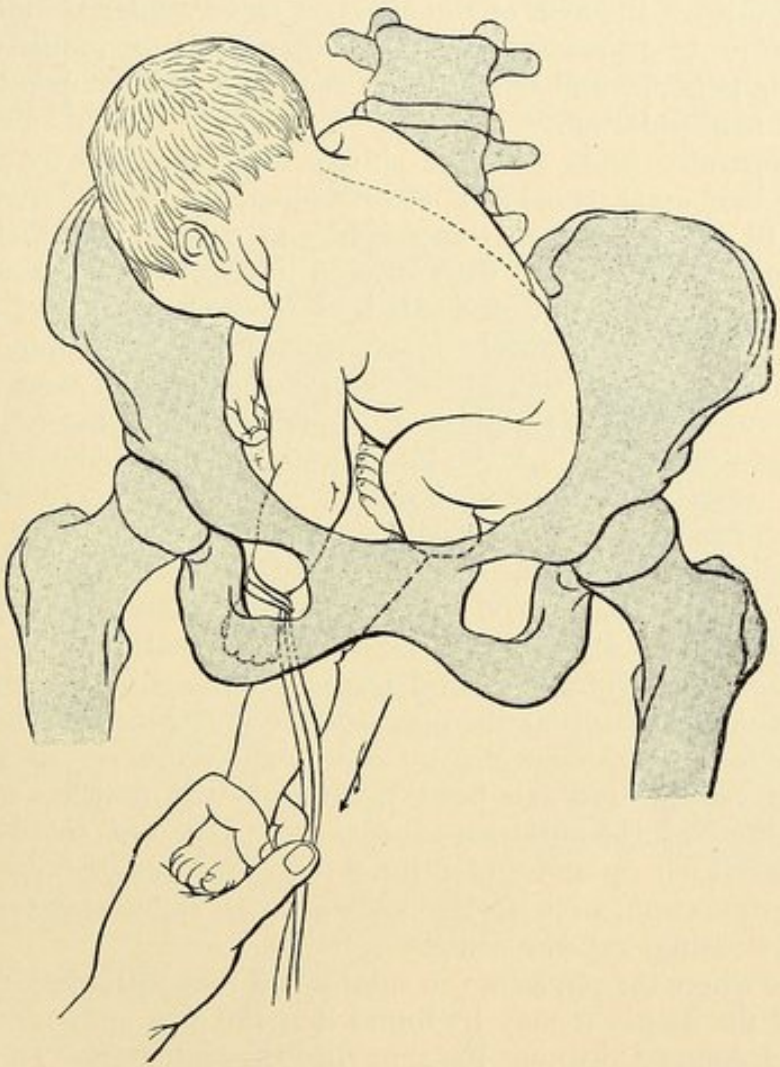
The advantages of combined version are that it can be performed before the os and cervix are dilated sufficiently to introduce the hand, as version can be done in this manner when only two fingers are carried through the os and cervix. It is not attended with danger to mother or child if reasonable care be exercised in manipulation. It is often employed in placenta prævia, with the exception of the central variety, and has given good results.

Combined version is often an advantageous procedure when it is not necessary to turn the fœtus completely, but simply to rectify unfavorable positions. Thus, in beginning face presentation, in brow presentation, or when the shoulder is at the brim of the pelvis, the presenting part may be pushed up by this manipulation and the abnormal presentation converted into a favorable one.

By internal version are understood the introduction of the hand within the uterus and the turning of the child by grasping one or both of the feet. The indications for internal version are a transverse position of the fœtus, danger to the mother, like placenta prævia, which obliges the physician to deliver her at once. Anæsthesia is always required for internal version, and chloroform is to be preferred for this purpose. The operator will find it grealty to his advantage to map out the fœtus carefully. He can thus acquaint himself with the position of the head and feet and be guided by this information as to the choice of the hand to be inserted within the uterus. The patient should be placed upon her back or side at the edge of a bed or table. The bladder having been emptied by catheter, the vagina should be thoroughly douched with carbolic acid or creolin, 2 per cent., and the hands and arms of the operator be thoroughly antisepticized. The physician should then select the hand which lies opposite the feet of the child. This hand is folded into a cone and gradually carried into the vagina and within the cervix, while the external hand should press the head gently upward from behind the pubes, to enable the other hand to secure a ready entrance. If the operator remembers the position of the feet, he will carry his hand upward and backward, as the vagina is curved upon its axis, and find them readily. The hand should be carried up into the pelvis, usually at one of the sacro-iliac joints. Considerable discussion has been caused by the question as to which foot of the child should be grasped. It is better, if possible, to seize the lower foot, because traction upon the lower foot and leg tends to turn the back of the child to the front and bring the body down in a position favorable for delivery. This precaution to seize the lower foot is especially important in cases where the back of the child is directed posteriorly. If the upper foot be grasped in these cases, it will partially rotate the fœtus upon itself and cause impaction of the body and head at the brim of the pelvis.

Where the back of the child is toward the front, if both feet can be readily found, it is well to seize them. They should be held by grasping them between the fingers and folding the thumb across the fingers, the nails of the hand being directed away from the wall of the uterus. When the feet have been grasped gentle traction should be made downward and backward, while at the same time the external hand carries the other extremity of the fœtus upward and also backward. As the feet and legs descend through the pelvis the delivery of the child becomes that of a breech presentation, of which a description has been already given under that title.

FIG. 178.



Internal version completed. (FARABOEUF and VARNIER.)

Where haste is not imperative it is often considered advantageous to bring but one foot and leg so far that the foot emerges from the vulva, the breech and other leg remaining within the cervix. As the legs tend to draw up into the uterus, it is well to slip a noose of soft bandage over the foot which has been brought down, in order to retain it. Where dilatation of the os and cervix has been but partially accomplished, the opening of the womb is often facilitated by bringing down

but one leg, leaving the smaller portion, the hips and the arms and leg, to dilate the uterus gradually.

The dangers of internal version lie in the fact that it requires the introduction of the hand within the uterus, thus exposing the mother to the dangers of septic infection or to violence to the lining membrane of the womb. In competent hands, however, these objections do not exist. The dangers to the child lie in the pressure to which it may be subjected, in asphyxia caused by pressure upon the cord, or from direct violence by unskilful manipulation.

If the placenta be healthy, it is very rare for it to become separated from the wall of the uterus during version. During the performance of version violent uterine contractions may be set up, which may so severely compress the arm of the operator as to render it almost impossible for him to proceed. Complete anæsthesia is required in these cases, while patience and strength are requisite in the operator, as well as skill in manipulation.

If the operator finds that the child's body is so tightly grasped by the uterus that great resistance is occasioned, he must desist from his efforts until the patient is completely and deeply anæsthetized. By gentle manipulation he will then succeed in effecting the version.

Internal version is contraindicated in cases of tetanus of the uterus in which the uterine muscle is contracted strongly upon the child and in which the lower uterine segment is excessively stretched and in danger of rupture. In these cases, if version be attempted, the uterus may tear at the junction of the lower and upper uterine segment and upon the anterior wall of the womb. Such cases are observed in patients who have been in impossible labor for a long time, the waters having drained away, while the child is often dead. A cautious effort may be made to perform version in such a case under chloroform pushed to complete anæsthesia. If this be impossible without doing violence to the uterus, embryotomy should be done if the child be dead. If the pelvis is contracted so that the operator cannot gain access to the child, it is better to deliver the fœtus by abdominal section. In performing version in cases where the head presents it will first be necessary to carry the head of the child gently upward to permit the hand of the operator to reach up and grasp the feet. This may be done by combined manipulation, or with the assistance of some one competent to practise abdominal manipulation.

In cases where the physician is summoned to a patient suffering from rupture of the uterus it may be found that the arm and shoulder of the child have escaped through the rent into the abdomen. In these cases version should not be employed, because the turning of the fœtus within the ruptured womb must increase the laceration and augment the danger to which the patient is exposed.

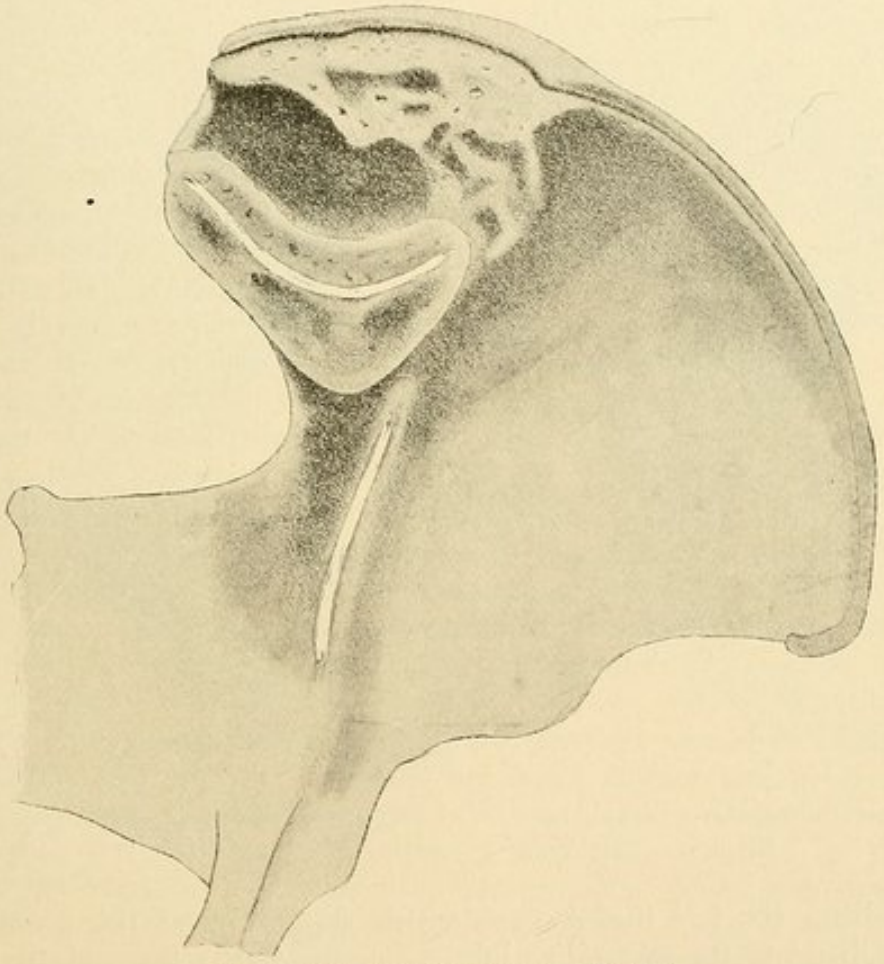
Version may be most quickly and easily performed immediately after or at the moment when the membranes rupture. If the operator can choose, he may rupture the membranes, immediately introducing the hand, while the wrist and forearm act as a plug to prevent the escape of the amniotic liquid. Under these conditions the child may readily be turned.

CHAPTER IV.

SYMPHYSIOTOMY.

By the operation of symphysiotomy is understood the opening of the pubic joint for the purpose of enlarging the pelvis. Experiments upon the pelvis make it evident that if the anterior wall of the pelvis be divided at the pubic joint or through the rami of the pubes, the two halves of the pelvis will separate and that a considerable gain in several diameters of the pelvic brim will follow. If the pubic joint be separated in a cadaver, it is observed that the two halves of the pelvis will rotate outward, the rotation taking place upon the sacro-iliac joints.

Fig. 179.



Iliac portion, sacro-iliac joint. (Klein.)

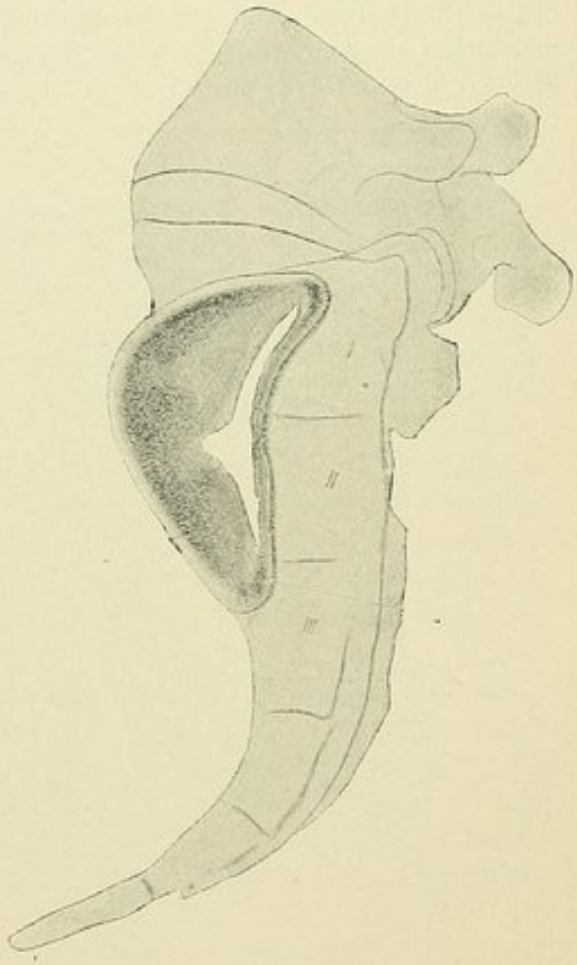
The practical result of this rotation is to enlarge the pelvis in its antero-posterior and transverse diameters and also in the oblique. The relative enlargement between these several diameters by symphysiotomy is that of one, two, and three, respectively. If the separation of the pubes

be carried to a degree of 2½ or more inches, the ligaments of the sacro-iliac joints are put so severely upon the stretch that some fibres are ruptured. Although the varying degrees of enlargement of the pelvis have been carefully computed, for practical purposes it is sufficient for the obstetrician to remember that the antero-posterior diameter of the pelvic brim is enlarged to a slight extent, while the oblique diameters are considerably increased. When the fact is taken into consideration that the oblique diameters of the pelvic brim are most important, because the presenting part passes through the pelvic brim with its long diameter in one of the obliques, the practical advantage of symphysiotomy becomes at once evident.

FIG. 180.

Sacral surface, sacro-iliac joint. (KLEIN.)

FIG. 181.



Sacral surface, sacro-iliac joint in pregnancy. (KLEIN.)

Recalling the fact that a considerable separation of the pubic bones does violence to the sacro-iliac joints, it can readily be seen that symphysiotomy is indicated in cases where but a moderate degree of pelvic enlargement is necessary to permit delivery. In high contracted pelves, in pelves deformed by reason of disease of the bones, which renders the bones more heavy and firmly knit together than normal, symphysiotomy is contraindicated. In women older than forty years, in whose skeletons ossification has advanced considerably further than in younger

women, symphysiotomy may be found difficult by reason of the deposit of bony material in the pubic joint.

A point of great practical importance is the fact that while symphysiotomy enlarges the brim of the bony pelvis, it does not contribute to the enlargement of the soft parts of the birth-canal. In cases where the head has been prevented from descending into the pelvis by disproportion the usual dilatation of the soft parts is not gained, the result being that the cervix and vagina are in no way prepared for the expulsion of the child. If labor be prolonged, the cervix will be drawn up upon the child's head and partially dilated; but complete dilatation of the cervix is rare in such cases before the operation is performed. Immediately after symphysiotomy it is usual to find the head upon the pelvic floor, as the obstacle in descent being removed the head comes rapidly down. As it emerges from the vulva the anterior wall of the vagina is carried upward against the pubic bones. After symphysiotomy the cut ends of these bones may cause injury more or less severe to the anterior vaginal wall during the expulsion of the head. Severe laceration of the tissues about the urethra occasionally results, while in other cases the parts are contused to such an extent that necrosis readily follows. For this reason it is evident that symphysiotomy is most successful in cases where the vulva and vagina are well developed and where the parts are dilated from previous labor or may be readily dilated. When, however, the limitations for symphysiotomy are understood and cases are selected in accordance with these facts, the operation has a distinct field, and properly performed will save the lives of many children at small risk to the mother.

The positive indications for symphysiotomy are disproportion between the fœtus and the pelvis, which is not so great but that a moderate enlargement of the pelvic brim will allow birth to proceed. So far as pelvic measurements are concerned they give but one factor in the solution of the problem. Symphysiotomy will be most successful in pelves whose antero-posterior diameter measures from 8 to 9½ cm. internally. The other important factor in the problem, namely, the size of the child's head, can only be ascertained approximately by careful observation. If necessary, an examination should be made under an anæsthetic, in which the head can be thoroughly palpated and an endeavor made to cause it to descend into the pelvis by suprapubic pressure. In young patients Walcher's position should be tried before abandoning the attempt to bring the head within the pelvic brim. When, however, the head is evidently too large to descend, as shown by careful examination, it is evident that disproportion in the size of the head exists which renders the choice of an operation necessary.

As symphysiotomy is a life-saving operation for the child, it is not to be selected where the fœtus has already perished, as the operation, like all surgical procedures, gives the best results when performed upon patients who are not exhausted.

Cases are sometimes seen in which the child is dead when the physician first is called to his patient. In such a case craniotomy is clearly indicated if the child is too large to be extracted with the forceps. If the disproportion between the head and the pelvis is considerable,

craniotomy may not succeed in lessening the size of the head sufficiently to permit of its extraction. In such a case the operator would be driven to choose between delivery by abdominal section, embryotomy, and delivery of the fœtus piecemeal, or symphysiotomy following craniotomy. By the latter, symphysiotomy after craniotomy, a patient can be delivered with least risk of serious injury and with a fair prospect of recovery.

If suitable instruments are available, the skull could be crushed in such a case and extracted without special difficulty.

The operation should not be chosen in women already infected with sepsis or so weakened by long labor or hemorrhage that their strength is greatly reduced. As the operation requires antiseptic precautions, if these are not available it is not wise to do symphysiotomy, as the after-care of such a patient is a matter of much labor and some difficulty. Unless good nursing can be obtained, the operation should not be selected.

To summarize the positive indications for symphysiotomy, it is successful where but moderate disproportion between the size of the child and the mother is present, where mother and child are in good condition, where the soft parts of the birth-canal are dilatable, and where proper care during and after the operation can be obtained.

The preparation of a patient for symphysiotomy requires that the rectum and bladder be thoroughly emptied. The hair should be shaved from the pubes and the skin above the pubic region should be thoroughly scrubbed with soap and hot water, rinsed with hot water, and scrubbed with bichloride of mercury solution, 1 : 1000, and rinsed with alcohol. The pubic region should be coverd with bichloride-gauze until the moment of operation. Ether is the best anæsthetic for symphysiotomy, although chloroform may be used if ether cannot be procured. For the convenience of the operator the patient should be laid upon a table of convenient height; a common kitchen table answers well if no better is at hand. The table should be so placed that the patient can be brought down to its edge for the delivery of the child. The table should be covered with a blanket, and at the foot a rubber sheet, with clean linen over the sheet and blanket. The upper portion of the patient's body should be covered with woollen and the feet and legs be wrapped in blankets or covered with appropriate leggings.

The operator will require a competent person to give the anæsthetic, a competent medical man to assist him, and in addition the services of a nurse or of some one who will absolutely obey his directions.

The instruments required are an ordinary scalpel, a pair of uterine dressing-forceps, a half-dozen pairs of hæmostatic forceps, a probe-pointed, strongly made bistoury, a metacarpal saw, a urethral sound or English catheter, and an axis-traction obstetric forceps. These forceps should preferably be of the Tarnier pattern, designed to fit accurately upon the sides of the head. In addition to the ordinary surgical dressing, antiseptic gauze may be torn in strips four inches wide and a yard long. Iodoform or boric acid in powder must also be ready. For closing the wound silkworm-gut is best. A curved needle, needle-holder, and scissors will be required. It is well to have hot and cold water ready for resuscitating the child if necessary.

The patient being anæsthetized and the hands and arms of the operator and assistant having been thoroughly scrubbed with soap and water, rinsed in hot water, scrubbed in bichloride solution, 1 : 1000, and rinsed in alcohol, the dressing is removed from the suprapubic region and the field of operation is surrounded with clean linen; an incision is made in the central line at two fingers' breadth behind the pubic joint, extending upward for one and one-half to two inches. The sound or catheter may be introduced into the bladder by an assistant and held as a guide. This precaution is not necessary, although many practise it. The incision should extend through the skin and fascia and the fatty and connective tissues which lie above the peritoneum and behind the pubic joint. This tissue is to be separated from the joint by the fingers until the fingers can be passed around the joint from beneath. If needed, the incision may be prolonged downward, although it should not be extended further than a quarter of an inch above the posterior border of the joint. When the fingers can be passed beneath the joint the probe-pointed knife may be inserted along the fingers, and carried from below upward and over the joint forward through the cartilage of the joint.

Difficulty is sometimes experienced in finding the joint. The landmark upon its superior surface is a depression or notch which is present in the well-formed pelvis. Some prefer to cut from above downward, placing the knife upon the joint at the notch, allowing the probe-point to project just anteriorly to the surface of the joint, while the finger of the operator below guards the tissues from injury. The knife may be carried through the cartilage in this way until the subpubic ligament is reached, when it may be reversed and passed along the finger and the ligament severed from below upward. The opening of the joint is not complete until the ligament has been severed, for experience has shown that the two halves of the pelvis will not separate readily until the ligament is cut.

While no vessel of considerable size is opened in symphysiotomy, the connective tissue behind the pubic joint oozes sufficiently to require a tampon of antiseptic gauze to be applied during the extraction of the child. The gauze should be passed with uterine dressing-forceps behind the pubic joint and between the cut halves of the bones. It serves a double purpose in checking oozing and in carrying the urethra and anterior vaginal wall away from the pubes, so that they will not be injured when the bones are brought together. Antiseptic gauze is then placed over the incision, the sound in the urethra is removed, and the patient is brought to the edge of the bed or table for the delivery of the fœtus. In cases where the joint cannot be opened with a knife by reason of the presence of bony tissue in the cartilage the metacarpal saw may be used to advantage.

While the patient is brought down to the edge of the bed or table and during the delivery of the child, pressure should be made by two assistants upon the trochanters of the femora to prevent undue separation of the two halves of the pelvis. Delivery is usually effected in these cases by the forceps. While it is possible to make version, still a better result is obtained if the axis-traction forceps be carefully

applied to the sides of the child's head. In making traction special care should be taken to flex the head strongly and pull downward and backward with the forceps, the object being to prevent injury to the anterior vaginal wall by the occiput while distending the entrance to the vagina. If the vagina is small and the perineum resisting, double episiotomy will assist in avoiding serious laceration. When the head of the child is delivered the delivery of the body is accomplished in the usual manner. The placenta should then be expressed and the patient thoroughly examined to ascertain the presence or absence of tears of the anterior vaginal wall or of the tissues about the urethra. The tissues should be thoroughly douched with creolin, 2 per cent., and any laceration of the vaginal wall should be closed by continuous catgut suture. Laceration of the perineum and pelvic floor should be repaired unless the patient is in such a condition of shock as to make such repair impossible. The gauze tampon should then be removed from the symphysiotomy-wound, the patient being drawn back again upon the table; the tissues behind the pubes should be thoroughly sponged out with antiseptic gauze and a fresh gauze tampon be carried just behind the ends of the pubic bones to the bottom of the space behind the pubes. The wound should then be closed with interrupted silkworm-gut stitches, the last stitch, where the gauze drain is inserted, being introduced but left without tying. The wound should be freely sprinkled with iodoform or with boric acid and a firm antiseptic dressing applied.

It has been repeatedly observed by various operators that after symphysiotomy the head often descends upon the pelvic floor with the occiput turned toward one or the other of the sacro-iliac joints. In many cases the occiput pointed anteriorly before the operation, but turned behind after the symphysis was opened. No complete explanation is afforded of this rotation of the occiput, unless it be that the manipulation required in performing symphysiotomy, when the operator's hand in the opening behind the symphysis naturally makes pressure upon the head beneath, may result in turning the occiput behind the median line of the pelvis. Another cause would be the tendency of the presenting part, universally seen in labor, to accommodate itself as best it can to the shape of the pelvis. The greatest available space being at the sides of the sacrum, it is natural that the largest portion of the head should turn into this available space.

This rotation has an advantageous element for the delivery of the head after symphysiotomy. With the occiput behind and strong flexion produced by forceps the anterior wall of the vagina will be less tightly stretched than if the occiput were in front, and the danger of laceration against the cut ends of the pubic joint will be considerably lessened. In most of these cases the occiput is upon the right side of the pelvis, at the right sacro-iliac joint.

In using forceps in these cases the operator must be careful to apply them accurately to the sides of the head and to make axis-traction strongly downward and backward. He will thus secure the descent of the head in the best possible manner, and when the pelvic floor is distended by the occiput he should cautiously raise the forceps, producing complete flexion of the head. The anterior portion of the head is

smaller than the posterior, and less likely to do injury to the vagina. Injury to the pelvic floor usually happens in these cases; but if episiotomy be done upon one or both sides, the injury will be prevented from becoming a serious one.

Should the fœtus have been in face presentation before the symphysis was opened this presentation can usually be readily corrected after the opening of the pubic joint, because the enlargement of the pelvis relieves the pressure upon the head and permits the substitution of the small occipito-frontal diameter for the greater occipito-mental or maximum.

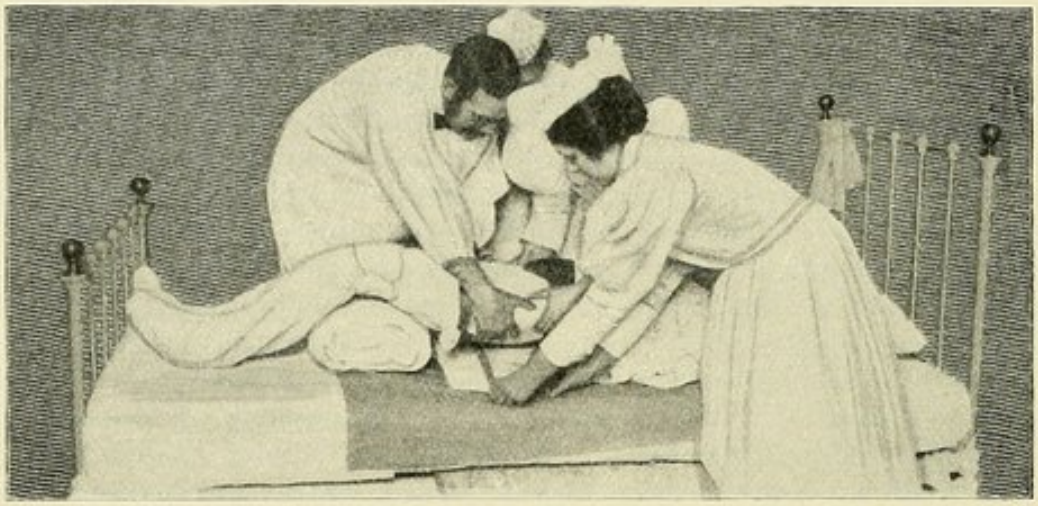
Should the fœtus present by the breech the case is not so favorable for symphysiotomy, and the operation, if possible, must not be chosen. In delivering the after-coming head, the occiput being in front, the greater portion of the head is brought against the anterior vaginal wall, putting the tissues strongly upon the stretch and tending to tear them by forcing them against the cut ends of the pubes. In such a case it is difficult for the operator to make pressure on the occiput behind the pubes, because of the incision and of the severed symphysis. Delivery can often be best effected in such a case by having an assistant raise the body of the child while the operator applies forceps to the head and by making strong flexion reduces as far as possible the pressure of the occiput against the anterior vaginal wall. Some of the lacerations in this region which are most inconvenient to repair are found in the vicinity of the urethra and near the clitoris. A small vessel in this region may be opened and free bleeding may result. Such must be checked by suture and by closing the laceration with catgut or fine silk.

One of the most important problems connected with symphysiotomy is the choice of a method to immobilize the pubic joint during the patient's recovery. A strong binder may be fastened tightly about the patient; a canvas belt with straps and buckles may be applied; and a plaster-of-Paris cast may be employed. While various means have been used successfully to accomplish this purpose, the writer has succeeded well by using a single strip of the best rubber adhesive plaster, six to eight inches wide and long enough to pass completely about the patient. The application of the plaster requires the united work of several persons. The patient's pelvis should be raised with great care, strong pressure being continued upon the trochanters of the femora. The plaster strip should then be passed beneath the patient, the muslin upon the face of the plaster not being removed until the strip is in position, ready for application. It should pass around the pelvis in such a manner that the centre of the strip extends over the trochanter on each side. When the muslin is removed the strip should be brought up and around the patient by two persons stationed opposite to each other, each pulling strongly outward. It is of great importance that the plaster be kept perfectly smooth and that it be thus applied to the body of the patient. The plaster passes over the pubes, firmly holding the two ends of the bones in apposition. Should the edges of the plaster come so low as to interfere with the bowel or with the care of the genital tract or of the bladder, it may be trimmed away with scissors. If the plaster is well applied, no binder is needed to keep the pubic joint immobilized. Should the obstetric binder be applied, care

must be taken not to apply it tightly, as considerable distention of the intestines sometimes follows the operation and is a source of discomfort to the patient, if she has in addition a tight binder.

In applying adhesive plaster-dressing after symphysiotomy care must be taken lest the uterus be pressed upward out of the pelvis by the plaster strip, and thus uterine relaxation and hemorrhage be induced.

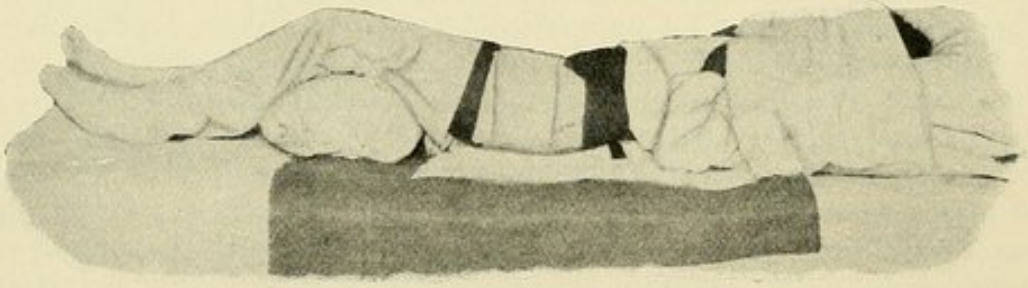
FIG. 182.



Applying a reinforcing strip of plaster after symphysiotomy.

This can best be avoided by trimming away the plaster at its upper edge in a curved direction, in such a manner that the convexity of the curve is toward the pubes and its concavity toward the womb. As long as the strip exercises its pressure firmly and evenly over the trochanters it is unnecessary that its pressure on the parts above should

FIG. 183.



Symphysiotomy patient with dressings.

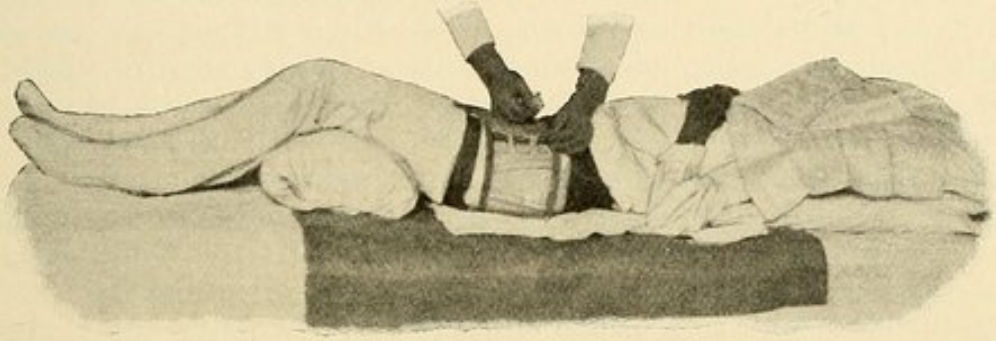
be so firm. A light flannel binder or many-tailed abdominal bandage may be applied over the abdomen, making gentle pressure from above downward, and thus keeping the uterus in its proper position in the pelvic brim. Pressure upon the abdomen should be as gentle as possible to avoid compressing the intestine, and thereby favoring the occurrence of intestinal complications, which might lead to inflammatory conditions or even to partial occlusion of the bowel.

An occlusion antiseptic dressing should be placed over the vulva and the patient's knees be bandaged together with a flannel bandage.

It is of importance that the bladder be emptied completely in these cases, although patients usually go for a considerable time without passing urine. The urethra is often swollen after symphysiotomy, and the first catheterization of the patient is often difficult and painful. Some operators prefer to leave a soft catheter in the bladder, attaching to it a rubber tube which terminates in a vessel at the side of the bed. Usually the patient must be catheterized for several days after the operation, after which she will empty the bladder spontaneously. If the catheter must be passed, the limbs must be freed from the bandage and slightly separated and the parts thoroughly cleansed with bichloride solution, 1 : 2000. It is usually necessary to perform this manipulation under the guidance of sight, and in the night it is convenient to employ a candle for this purpose. Experienced and skilful nurses seldom have difficulty in performing this manipulation, but a careless and ignorant person will not usually succeed.

The after-care of the patient delivered by symphysiotomy is essentially the same as that given to every puerperal patient. These cases, however, must lie upon the back for between two and three weeks, which is often irksome and very trying. The bowels should be moved freely the day following the operation.

FIG. 184.



Applying the belt dressing third week after symphysiotomy.

While the vaginal douche is unnecessary, the orifice of the urethra and the external parts should be thoroughly cleansed with bichloride solution, 1 : 2000, after each micturition, or whenever the napkins are changed. At the end of the first twenty-four hours the edge of the adhesive plaster may be raised sufficiently to open the dressing partially, remove the gauze drain, and tie the stitch which was left untied at the operation. Should the adhesive plaster become loosened or stretched a second strip may be applied over the first, or the first may be removed and another substituted. It is of the greatest importance that the patient's pelvis be held firmly and steadily by one or more experienced persons. When the strips are changed the patient's skin should be washed with soap and water and then with alcohol.

Once daily the patient may be lifted from her bed by three persons, one taking the shoulders, another the pelvis, and the third the legs and feet, and laid upon a firm, hard mattress or a table or board covered with blankets. The patient's bed may then be made, when she will be much more comfortable for the change. Her diet should be

that usually given to puerperal patients. The operation does not necessarily interfere in the least with lactation.

The patient must be kept on her back, preferably for three weeks. At the expiration of that time the plaster strip should be removed and a canvas binder with straps and buckles should be substituted for it.

The strip of adhesive plaster, however, furnishes the most comfortable dressing which a patient can wear, because of its thinness, the absence of buckles or straps, and the perfect approximation which it gives to the body of the patient. An inferior quality of adhesive plaster cannot be used after symphysiotomy, because it stretches and does not adhere properly or tears, or because it becomes affected by the fluid about the region of the bowel and because the coating of the plaster may become separated. The best quality, if properly applied, will remain for from five to seven days without stretching sufficiently to make a new strip necessary. Should the strip of adhesive plaster stretch slightly, a second and narrower one may be applied over the first.

Another advantage of the plaster-dressing over a cloth binder or canvas belt is found in the fact that the canvas belt tends constantly to work up upon the patient's body, and this lessens its efficiency. Again, the belt at its posterior edge is uncomfortable for the patient to lie upon, especially if bones or ribs have been inserted in the belt, as in a corset, to maintain its shape. The ordinary binder is not sufficiently strong to make adequate pressure, and may slip up upon the body of the patient, as does the belt. The many-tailed bandage of flannel is most comfortable, but is not sufficiently firm to hold the pelvis. Plaster-of-Paris would seem on many accounts an ideal dressing, were it not for the fact that the patient must lie upon the dressing, which would be obviously impossible if plaster-of-Paris were used. If great care be exercised in cleansing the skin, in bathing the part beneath the strip with alcohol and ether, and in powdering any abrasion, however slight, with boric acid or oxide of zinc, the skin will not become injured beneath the plaster strip, and the patient will suffer very little inconvenience from the dressing.

The patient may then turn upon her side in bed as freely as she wishes. At the end of the fourth week she should sit up in bed, and then she may leave her bed. She will complain at first of stiffness in the limbs and especially in the hips, but these sensations will gradually pass away.

The after-results of symphysiotomy can only be ascertained by watching patients engaged at actual work for some time after the operation. If the pelvis of such a patient be measured, it will be found slightly larger in each diameter. Good union is commonly obtained at the pubic joint. This union is not always bony in character, but is fibrous or cartilaginous. In some cases close examination will reveal mobility in the two halves of the pubic joint. Patients frequently complain of inability to retain urine. In many cases no anatomical lesion can be found to account for this. These cases are usually relieved by sitz-baths. In other patients careful examination will reveal cystocele or a thickened condition of the tissue about the

urethra. In these cases anterior colporrhaphy will often be found advantageous. While cases of necrosis have been reported following the operation, they are rare and must not be considered as the immediate result of the operation. As a rule, it may be safely asserted that where symphysiotomy is properly performed under antiseptic precautions, the pubic joint unites firmly and well and the patient is able to walk and to perform such work as she did before the operation. The only disadvantage which has been observed after the operation has been irritability of the bladder and occasionally a pathological condition of the tissues about the urethra, demanding operative treatment.

As the sacro-iliac joints are sometimes severely stretched during delivery in these cases, it is of interest to observe whether permanent injury to these joints follows the operation. Such, however, is not observed as a rule, nor can it be found upon examination that the sacro-iliac joints in these patients are more movable than are those of other patients who have borne children.

The child does not suffer by extraction after symphysiotomy so greatly as in cases where delivery is effected without the operation, as the pelvis is made so large that usually less bruising and compression of the head occur than when delivery is effected, where disproportion exists, without the operation.

Should symphysiotomy be followed by such difficult delivery of the child as to cause its death in birth, it would be proof that the operation was badly chosen and that Cæsarean section should have been performed.

Symphysiotomy has been performed twice upon the same patient. The second operation was not more difficult than the first, and was followed by equally good results.

The mortality-rate of symphysiotomy is variously estimated at from 12 to 18 per cent. for the mothers. This varies, however, greatly in accordance with the skill of the operator and especially in proportion as good judgment is used in choosing the operation. In fact, the mortality from this operation in America has been due almost entirely to attendant circumstances, and not to the operation itself.

It cannot be undertaken in private houses so successfully or conveniently as in maternity-hospitals, as the after-care is much more laborious and trying than the care of a patient following an abdominal section. The mortality-rate for children after symphysiotomy is *nil*, as far as the operation itself is concerned. The procedure is a life-saving operation for the child.

CHAPTER V.

CŒLIO-HYSTEROTOMY (CÆSAREAN SECTION).

By cœlio-hysterotomy is understood incision of the abdominal wall and of the uterus, followed by extraction of the child and suture of the uterus and of the abdominal wall. The term Cæsarean section is commonly applied to this operation.

This procedure is indicated in cases where the disproportion between the child and the pelvis is so great that the child cannot be delivered through the vagina. The disproportion must be so great that delivery will not be possible after symphysiotomy. If pelvic measurement be taken as a guide, the operation is indicated in cases in which the antero-posterior diameter of the pelvic brim internally is less than 8 cm. or 3⅛ inches. This is the simplest form of surgical delivery and also that which was first practised. The operation has become so familiar among different nations and in different ages that in point of antiquity and frequent performance it is one of the first and most commonly practised of all surgical procedures in obstetric practice. In order to be successful mother and child must be in good condition. Thorough cleanliness must be observed, and the uterus must be sewed together tightly after its contents have been removed. It is not of importance what presentation the fœtus occupies, nor does the situation of the placenta make a decided difference in the prognosis of the operation.

The best results are obtained in cœlio-hysterotomy in patients who have been but a short time in labor and patients in whom no other form of delivery has been attempted. Some have found that it is unnecessary to wait for labor before operating, but that good results are obtained before labor actually begins. We prefer, however, to operate during the first stage of labor, when dilatation is partially completed. The patient should be prepared for operation by thoroughly emptying the intestines and bladder, by a full and thorough bath, followed by scrubbing of the abdomen with soap and hot water, rinsing with hot water, and scrubbing again with bichloride solution, 1 : 1000, and finally with alcohol. An antiseptic dressing should be applied over the lower half of the abdomen. The patient should be placed upon a convenient table in a good light. It is of advantage to use a table which has an attachment capable of giving the Trendelenburg posture if needed, although in this operation it is very rarely demanded. The operator will require a competent person to give ether, and an experienced assistant to control hemorrhage. Several good nurses are desired, while the interests of the child will be best guarded by a competent physician.

The instruments required are a large scalpel, a dozen pairs of hæmostatic forceps, a half-dozen curved needles of several sizes, scissors, dissecting-forceps, and needle-holder; while hemorrhage may be controlled

by an elastic tube drawn tightly about the cervix, it is much better to depend upon the skilful grasp of a competent person. Aseptic material for sponging, boiled water, iodoform or boric acid, and surgical dressing are required. For suture, silkworm-gut, the best silk of medium and fine size, and catgut of medium size may be used Appliances should also be at hand for resuscitating the child, with stimulants usually employed in surgical practice.

The patient being etherized, the upper portion of the body and the lower extremities should be wrapped in woollen material and the field of operation surrounded by clean linen. The abdomen should be opened by a free incision of sufficient size to enable the operator to deliver the uterus containing the child through the incision. As this is done, a large sterile towel should be wrung out of hot water and placed over the intestines behind the uterus. It is well to bring together temporarily the abdominal wall behind the uterus before delivering the child. In some cases in which uterine contractions are strong, if the abdominal wall be brought together tightly behind the uterus, it is sufficient to control uterine hemorrhage.

The first assistant should then grasp the uterus firmly in his hands and circle the cervix in such a manner that the ulnar border of the hands can make pressure upon the vessels of the broad ligaments. Others prefer to grasp each particular ligament between the thumb and fingers, controlling the arteries in this manner.

When the first assistant is ready the operator opens the womb by an incision extending from its middle to an inch below the fundus. If a single cut be made, it is possible to complete the incision with the fingers, thus avoiding the possible danger of wounding the child. The membranes should be instantly ruptured and the child extracted by grasping the shoulder or feet, as may be most convenient. If the placenta is found beneath the line of incision, no time must be wasted, but the operator must instantly tear through the placenta and deliver the child. The hemorrhage cannot cease until the placenta has been removed.

As soon as the child emerges, it should be held head downward, the cord quickly clamped by hæmostatic forceps, and the child, with the cord and placenta attached, given in charge of an assistant. As a rule, it will be found that the uterus contracts well as soon as the child is removed. The abdominal cavity should be thoroughly sponged out and the uterus closed by two rows of sutures. The first should be interrupted silk sutures, each passing through the muscle down to the decidua. They should be a third of an inch apart, and should be so placed that the knot will be covered by the edges of the uterine peritoneum when these edges are brought together. These sutures should be carefully tied without great tension and cut short. The peritoneal covering of the uterus should then be brought together by continuous suture of silk or catgut, beginning from above and proceeding downward. When this suture is finished the uterus should be allowed to descend into the brim of the pelvis as after normal labor. The abdominal wall is then to be closed by a continuous suture of fine silk or catgut, bringing together the peritoneal surfaces. The skin, muscles, and

tendons should be closed by interrupted stitches of silkworm-gut. Ergot or ergotine should be given by hypodermatic injection and strychnine if surgical shock be present. The abdominal incision should be powdered freely with iodoform and boric acid and covered by a thick antiseptic dressing. As the dressing will not be removed for two weeks after the operation, it is well to bandage the abdomen with adhesive strips, using over these a many-tailed flannel bandage.

It is well to move the bowels as soon as the patient recovers from the anæsthetic and from the operation. This may be done by repeated doses of calomel and soda followed by a copious enema of glycerin, 1 ounce; magnesium sulphate, 2 ounces; spirit of turpentine, ½ ounce, with water to make 1 quart. In cases where ample time has been allowed to prepare the patient the movement of the bowels may not be attempted until the second or third day after the operation. In cases which have not been under treatment before operation it is better to move the bowels on the following day. The patient should wear an occlusion-dress over the vulva, which should be changed as often as needed, and the parts thoroughly cleansed with bichloride of mercury solution, 1 : 2000. The catheter may be used, if necessary; but should be discontinued as soon as possible.

The patient may be fed in the usual manner after abdominal section, and as soon as the bowels have moved her diet may be gradually increased. The child should be put to the breast as soon as the mother has thoroughly recovered from the anæsthesia and from the operation. Lactation is usually as well performed as if the patient had not been operated upon, and the after-course of the puerperal period is usually normal.

It is interesting to observe that, owing to the absence of tears of the cervix and vagina, the lochial discharge is scanty and contains nothing but serum.

The child is very often asphyxiated to a slight degree when delivered by Cæsarean section. It seems reasonable to think that this condition may be caused by the interference with the circulation which results from the compression of the uterus during the operation. It is readily resuscitated and usually quite as strong and often stronger than a child subjected to the pressure and possible injury of delivery through the vagina. The contour of the skull shows a lack of moulding from the absence of pressure against the bony pelvis.

The mortality-rate for mothers and children from this operation illustrates in a very marked degree the life-saving influence of skill and proper assistants in surgical procedures. A single skilful operator with competent help may deliver twenty or thirty cases without a maternal death. On the other hand, an exhausted patient may be operated upon without thorough antiseptic precautions and allowed to lose blood during the operation with fatal result. The complication most to be feared is that of hemorrhage, which, during the operation, can be controlled by skilful pressure. When proper assistance is not available, an elastic rubber tube may be fastened tightly about the cervix until the sutures have been inserted. Should hemorrhage become uncontrollable, the operator must ligate the broad ligaments, tying the

uterine arteries, amputate the uterus, and close the peritoneal surfaces tightly over the stump. Although cases are reported in which hemorrhage has been checked by the injection of ergot and the application of hot water or ice, these measures are so uncertain that no hesitation should be felt in promptly checking hemorrhage by resorting to hysterectomy.

It is evident that the operation of cœlio-hysterotomy leaves the patient capable of subsequent childbearing. Numerous cases are on record in which women have borne several children, each delivered by this operation. It is the operator's duty, however, to decide, after full consultation with the patient or her friends, whether the circumstances of the patient are such that she should be exposed again to subsequent operation or whether it is best and desirable that she produce no further offspring. If the patient be a woman without home and friends, illegitimately pregnant, and in circumstances in which she is not likely to be subsequently married or lead a moral life, this operation should be rejected for cœlio-hysterectomy, which renders further pregnancy impossible. On the contrary, if the patient be a married woman in circumstances of comparative comfort and the victim of no constitutional disease which may affect her offspring, the possibility of further pregnancy should not be destroyed unless the patient distinctly requests that this be done.

Physicians of large experience in hospital practice will recognize the fact that there is a considerable class in the community whose reproductive powers should not be indefinitely preserved.

The results of cœlio-hysterotomy and of cœlio-hysterectomy as performed in the best hospitals give so good a chance and so nearly an equal chance for recovery that the question of prognosis need not enter into the decision.

The stitches over the abdominal incision in these cases should be allowed to remain as long as possible. The abdominal wound is necessarily long, and should the patient be seized with severe coughing or straining the incision might reopen were the stitches removed too soon. As long as they do not cut they need not be removed. As a rule, however, in two weeks after the operation the dressing should be renewed, the stitches removed from the abdominal wound, the parts powdered with iodoform and boric acid, and a light antiseptic dressing applied to the abdomen.

The patient may usually leave her bed to stand upon her feet at the end of the third or fourth week. She should wear an abdominal support for several months after leaving the hospital.

If the continuous silk or catgut suture has been employed and buried beneath the tissues, it occasionally happens that the knots in the suture may not be absorbed, but may finally work their way out. This is accomplished by the formation of a small, fistulous tract leading down to the knot. The operator need not be annoyed by this occurrence, and he should not take steps too early to secure the removal of the knot. As soon as the thread of the suture has been absorbed the knot will gradually work its way toward the surface of the body, where it can easily be extracted. Such a fistulous tract will heal without great

delay, leaving a sound scar. The operator should avoid pulling upon such a knot because of the danger of disturbing the whole length of the continuous suture and possibly causing a separation of some portion of the wound. Examination has shown that silk sutures are absorbed by leucocytes which penetrate between the fibres of the suture, disintegrating the silk and causing its absorption. Unless a knot is unusually large and composed of unusually firm silk, the operator need not despair that this process will ultimately occur. In catgut absorption is much more easy, unless the suture has been chromicized, when it may be retained indefinitely.

Ventral hernia is one of the untoward results of abdominal delivery which the operator is naturally anxious to avoid. Patients are especially liable to this complication after Cæsarean section because of the great length of the incision and the fact that it is made through the abdominal walls which have been already greatly stretched and thinned during pregnancy. This can best be avoided by accurate apposition of the tissues by a firm, smoothly applied, but not a tight dressing, and by keeping the patient in bed until the abdominal wall has had time to undergo involution. Should the patient be troubled by obstinate cough with violent paroxysms, the cough must be allayed, lest in straining the patient may rupture a portion of the incision. Similar caution must be observed in cases of distention of the intestines after the operation, and violent straining in bowel-movements must be prevented. To allay cough, codeia may be given freely, and suitable remedies addressed to the bronchial tubes should be employed. Distention of the bowel must be prevented by promptly emptying the intestine by the use of the high rectal tube, by douches, feeding, and by suitable injections.

Sudden exertion or straining may bring about a partial or total rupture of the incision, exposing the patient to the dangers of injury to the intestine with the resulting peritonitis.

The treatment of ventral hernia after abdominal delivery consists in waiting until the patient has entirely recovered from labor, and then, under antiseptic precautions, dissecting out the sac of the hernia and uniting the borders of the hernial ring with suitable stitches.

The prognosis is excellent in these cases, and patients are rarely found who are permanently injured by the operation.

As cœlio-hysterotomy leaves the patient capable of repeated conception, it is naturally of interest to know what effect upon subsequent pregnancies the previous operation will have. The uterus is in most cases adherent more or less firmly to the peritoneal lining of the abdomen. As the womb increases in size its continued growth naturally makes tension upon these peritoneal attachments. Considerable pain and inconvenience are sometimes experienced from about the third to the sixth month of gestation. After that, however, the tissues stretch sufficiently. At the time of induced labor the descent of the uterus may be somewhat hindered by these adhesions and increased danger of failure in uterine contraction and resulting hemorrhage may be present. These disabilities are rarely serious, however, and rarely expose the patient to any considerable danger. Precaution should be taken in these cases to

stimulate uterine contractions, to deliver the patient promptly, and to see that the womb when emptied contracts efficiently.

Should a second operation of this sort be necessary, the uterus is usually found perfectly healed. It is sometimes difficult to detect the site of the former incision in the womb. No precautions are necessary to avoid opening the uterus in the old scar, and union is obtained readily after a second or even third delivery by this means. The knots of the sutures buried in the womb can sometimes be detected encysted in the tissues. If silver wire or silkworm-gut has been employed in buried sutures in the uterus, they should be extracted before the uterus is again united.

CHAPTER VI.

CŒLIO-HYSTERECTOMY, INCLUDING PORRO'S OPERATION.

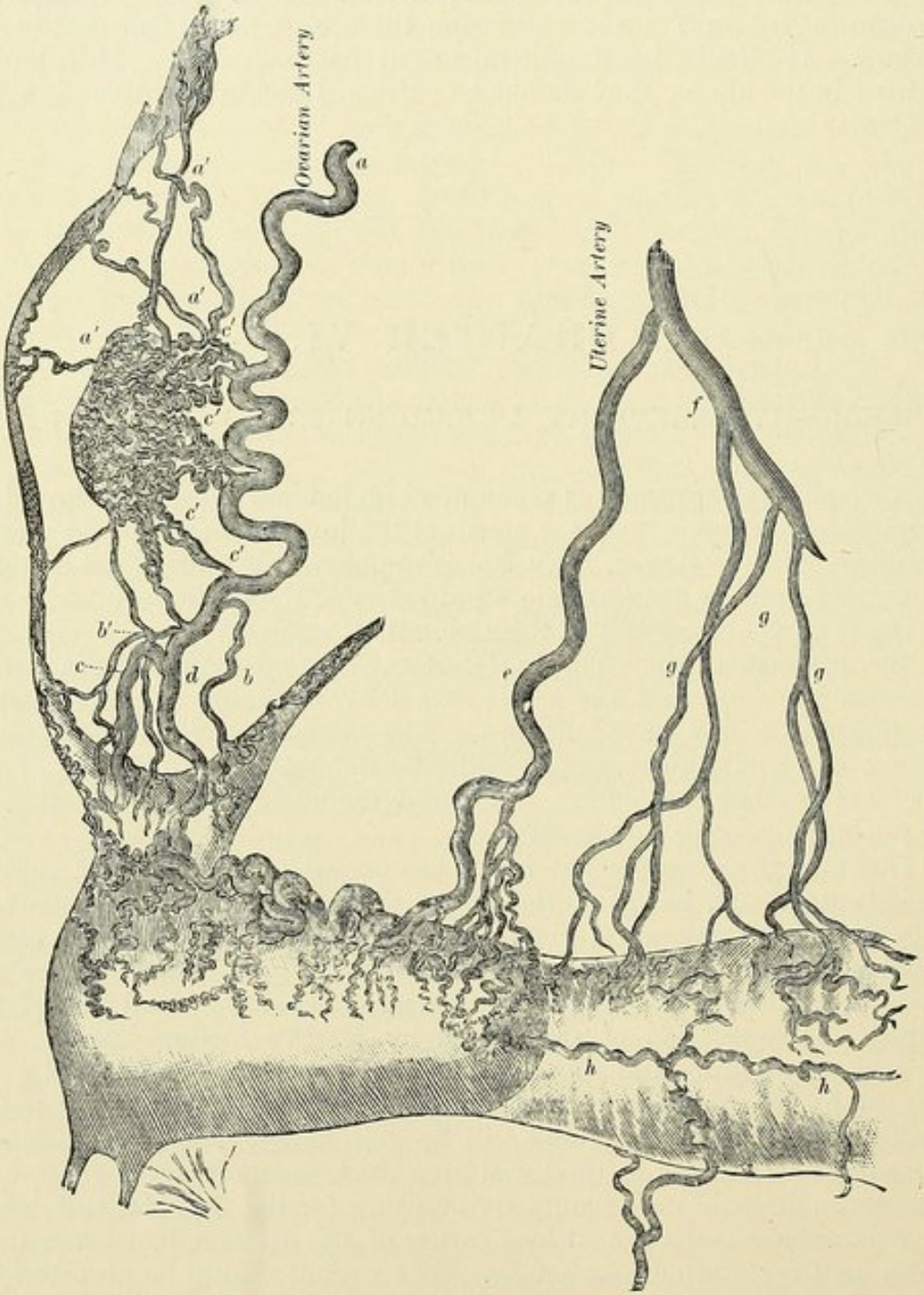
By cœlio-hysterectomy is understood abdominal incision followed by amputation of the body of the uterus at the junction of the lower uterine segment with the cervix. By Porro's operation is understood amputation of the uterus, leaving the stump outside the peritoneal cavity and fixing it at the lower end of the abdominal incision.

The indications for cœlio-hysterectomy are so great a disproportion between the head and the pelvis that delivery cannot be accomplished by symphysiotomy or by forceps. The choice between cœlio-hysterotomy and cœlio-hysterectomy will depend upon the decision of the operator to allow the patient to undergo the risks of a future labor or to render such danger impossible.

If subsequent pregnancy is not to be avoided, then cœlio-hysterotomy is indicated. If, however, the power of conception is to be removed, then cœlio-hysterectomy is to be performed. The choice between cœlio-hysterectomy and amputation of the uterus by Porro's method depends upon the skill and experience of the operator and the condition of the patient. Amputation of the uterus by Porro's method can be performed very simply and rapidly, and, if the operator has not had practice in hysterectomy for other conditions, and if the patient is not in such a state that hysterectomy will be well borne, then amputation of the uterus by Porro's method will give the best results. In cœlio-hysterectomy there is no advantage in waiting for the first stage of labor, as hemorrhage is controlled by ligature of the arteries, and hence there is no need for uterine contraction. The patient should be prepared for the operation in the manner described in treating of cœlio-hysterotomy. It is indispensable that the operating-table should have an apparatus for placing the patient in the Trendelenburg posture, as this is necessary in ligating the arteries at the bottom of the pelvis. The operator will require a large scalpel, a dozen pairs of hæmostatic forceps, two

blunt-pointed curved needles on long handles, Chinese silk of good size and also fine, scissors and needle-forceps, curved needles and suture-material, including catgut, silkworm-gut; several pairs of large forceps for clamping the broad ligaments are also useful. Some operators find clamps used in vaginal hysterectomy convenient.

FIG. 185.



The ovarian, uterine, and vaginal arteries. (HYRTL.)

a. Ovarian artery. *a'* and *b'*. Branches to tube. *b*. Branch to round ligament. *c*. Uterine artery. *c'*. Branches to ovary. *g*. Vaginal artery. *h*. Azygos artery of vagina.

The abdomen having been opened and the uterus delivered through the abdominal incision, a large, soft towel, thoroughly sterilized and

wrung out of hot water, is placed behind the uterus and over the intestines. While the chief assistant controls hemorrhage, the uterus is rapidly incised and the child and its appendages removed. Up to this point the operation has not differed from cœlio-hysterotomy, commonly known as Cæsarean section.

Instead, however, of closing the uterus by suture, the operator then proceeds to ligate the ovarian arteries and the broad ligaments, clamping the ligament next to the uterus with suitable forceps and cutting through the broad ligament along the external edge of the forceps. In the pregnant patient the bloodvessels of the pelvis are greatly enlarged. The arteries can be plainly felt, while the veins are clearly evident.

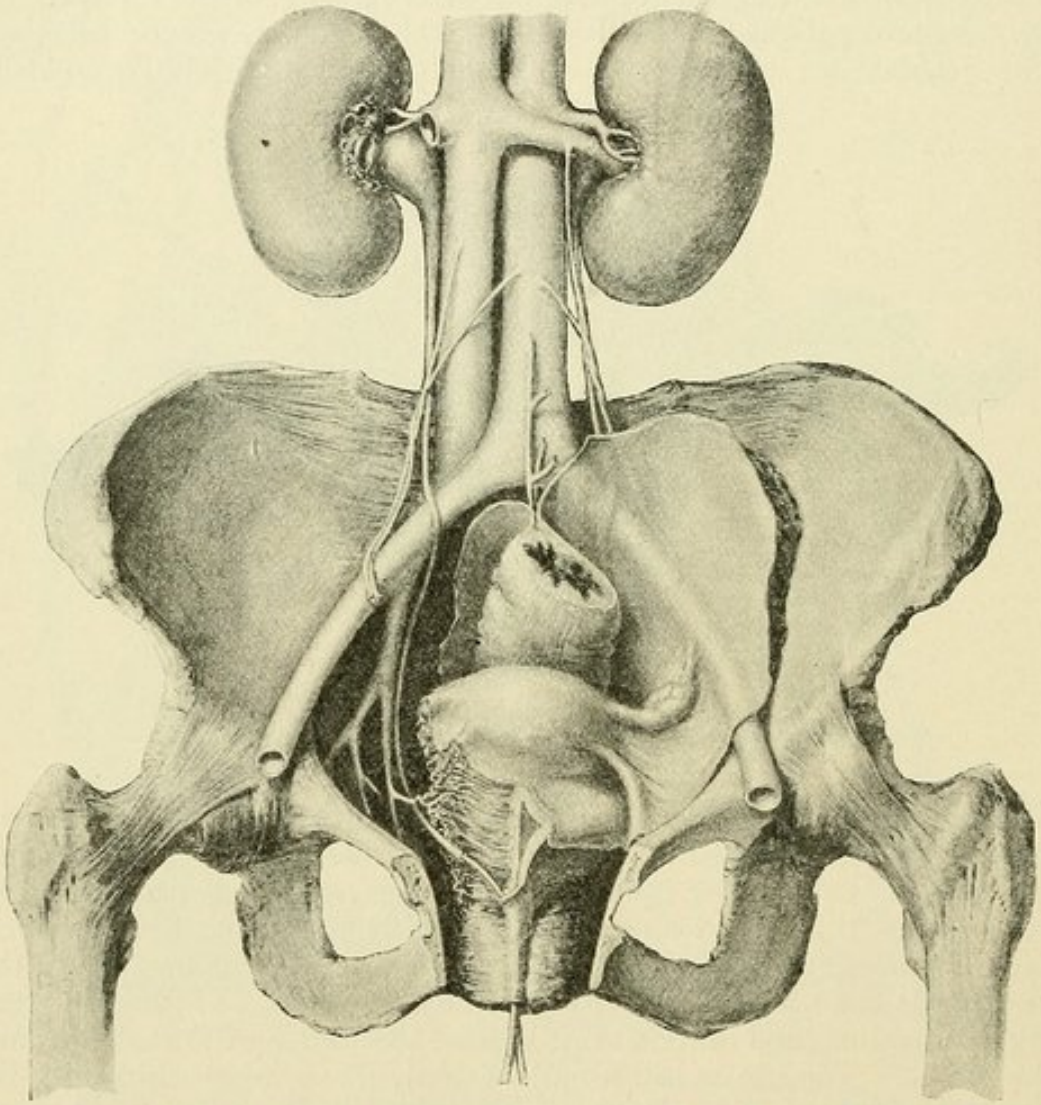
FIG. 186.

Uterus, tubes, and ovaries.
Hysterectomy for contracted pelvis, with intrapelvic treatment of the stump.

The ligation of the ovarian arteries is comparatively simple. Especial care, however, is needed in ligating the uterine arteries where the vessels pass in at the upper border of the cervix. It is well to grasp the vessel in the thumb and finger, passing the ligature from without internally and keeping the point of the needle as closely as possible to the uterus. It must be remembered that the ureter may be ligated in passing this ligature, and caution must be used in directing the needle toward the uterus. The ureter can usually be felt, like a large whip-cord, beneath the fascia. When the ligatures have been passed and cut short, the uterus is to be freed from the broad ligaments down to the upper border of the cervix and the lower edge of the lower uterine segment. The uterus is then to be amputated at the junction of the cervix with the lower uterine segment. If bleeding points are left in the stump, they should be seized with forceps and ligated with fine silk. If the stump oozes freely, silk sutures may be buried in the muscular and elastic tissue, and covered by the peritoneal flaps. The flaps of the peritoneum which are left on the anterior and posterior surfaces of the stump must be brought together by a firm, continuous suture of fine silk and the abdomen closed by continuous suture of the peritoneum and interrupted stitches in the muscles and skin. As the operation is an aseptic one, no

drainage is required in uninfected patients. Should, however, the operation be performed upon a patient whose uterus is in a condition of septic infection, it would be advisable to employ drainage, or, if the uterus were profoundly affected, to perform complete extirpation, removing the stump of cervix, packing the lower portion of the pelvis with iodoform-gauze and bringing the gauze through the vagina.

FIG. 187.



Peritoneum of one side of pelvis removed to show bladder, uterus, uterine artery, and ureter. Bougies inserted in the ureters, illustrating the danger of wounding ureter in hysterectomy. (CLARK, Johns Hopkins Bulletin.)

The recovery of these patients is usually attended by no serious complication. Lactation may be delayed, but should ultimately be established successfully. The dressing should not be removed for two weeks, and the case should be treated as usual with abdominal section. It is well to move the bowels thoroughly soon after the operation and to retain the stitches in the abdominal wound as long as possible.

There is no lochial discharge in these cases, as the uterus has been removed and there are no torn surfaces in the birth-canal.

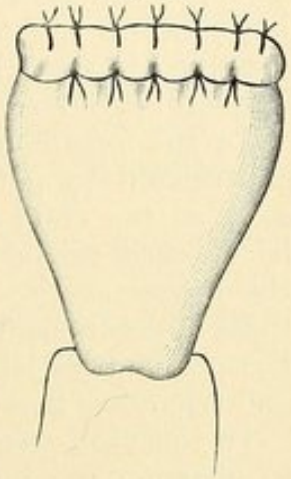
A discharge of blood-stained mucus may persist in these cases for a few days, occasioned by oozing from the cervix mingled with a discharge of the enlarged glands of the cervical mucous membrane. This, however, soon ceases and requires no attention beyond the use of an occasional antiseptic dressing. Douching is unnecessary in these cases and might possibly be productive of harm.

The advantages of this operation over cœlio-hysterotomy are the facts that it renders further conception impossible; that it controls hemorrhage by ligation of the ovarian and uterine arteries; and that it leaves the pelvis in the best possible condition for prompt recovery of the patient.

While experience with this operation has not been so extensive as with Cæsarean section or Porro's operation, still its results have been so good as to indicate that it is the best form of delivery by abdominal section when future pregnancy must be avoided.

Porro's operation is performed by abdominal incision, delivering the uterus through the abdominal wall and controlling hemorrhage by passing a wire or rubber loop about the cervix, transfixing the stump with long pins, emptying and amputating the uterus, and leaving the stump in the lower end of the abdominal incision. The tubes and ovaries are drawn up and removed with the uterus, as is the case in cœlio-hysterectomy.

FIG. 188.



Closure of stump after cœlio-hysterectomy. (ZWEIFEL.)

Some operators prefer to check hemorrhage by passing a solid rubber cord about the uterus at its neck, drawing it tightly, and transfixing the cervix with two knitting-needles passed at right-angles to each other. In using the wire loop the wire should be placed around the cervix and the screw tightened, while the transfixing-pins should be thrust through the stump at right-angles to each other. The peritoneal surfaces of the abdominal incision are closed by continuous catgut suture, and the suture is carried through the peritoneal covering of the stump around its entire circumference. By this means the stump is shut off from the abdominal cavity and the danger of infection is greatly lessened. The abdominal wall is then closed by interrupted sutures down to the stump. The cut surfaces of the stump are powdered freely with iodoform. Some operators prefer to sear the stump with Paquelin's cautery or to cauterize with a strong solution of carbolic acid. A heavy antiseptic dressing is applied over the stump. As a rule, the stump will slough in from ten days to two weeks, leaving a depressed and granulating surface which will gradually close.

The advantages of Porro's operation are simplicity and rapidity of execution. The disadvantages are leaving of cut and open surfaces of the stump through which infection may enter, and also the fact that hemorrhage is less perfectly controlled than by ligation of arteries. Cœlio-hysterectomy is so far superior to the Porro operation that the former should be employed whenever possible.

The maternal mortality in cœlio-hysterectomy when performed by

experienced operators and in good hospitals must be a low one. A sufficient number of these operations have not yet been performed to furnish a comparison with the more familiar methods of abdominal delivery. The mortality-rate of Porro's operation depends very largely upon the condition of the mother and the skill of the operator in controlling hemorrhage. Unless care be taken, secondary hemorrhage is likely to occur and may prove rapidly fatal.

The mortality-rate for children is essentially the same with each operation, and is a very low one. The most common cause of death among children in these cases consists in the bad effect of prolonged labor before the operation is actually undertaken. In well-selected cases and in good hands cœlio-hysterectomy furnishes one of the most efficient operations in obstetric surgery.

In the operation of cœlio-hysterectomy the greatest aid will be experienced by putting the patient in the Trendelenburg posture as soon as the child has been delivered. Bleeding from the uterus may be checked temporarily by placing a large clamp transversely across the uterus at the lower edge of the incision into the womb. With these precautions the operator can ligate the arteries and the broad ligaments at his leisure, keeping the tubes and ovaries next the uterus and removing these organs together with the body of the womb.

In the after-treatment of these cases caution should be observed not to abandon the hope of successful lactation, as the patient, if not a strong woman, may suffer sufficient shock to delay the formation of milk for several days. The child should be put to the breast, however, several times a day, and the breasts should be pumped at regular intervals to stimulate the formation of milk. Success may be achieved as late as a week after the delivery of the child. Children delivered by these operations are often partially asphyxiated and require resuscitation.

The asphyxia seen in children born by this operation does not resemble that observed in difficult labor, but is more like a physiological apnœa. As no violence whatever is done to the fœtus until the moment of its extraction, and as its removal from the uterus requires but a moment, the fœtal blood is not poor in oxygen in these cases, nor is it charged with carbonic acid. It is fully oxygenated through the placental circulation, and hence the fœtus will not breathe until it is separated from the uterus and has exhausted the oxygen already contained in the blood at the moment of extraction.

No prolonged efforts are needed in these cases to bring about vigorous respiration.

If the delivery has been quickly accomplished, the child will not have inspired fluid from the uterus, and hence will be the more easily brought to breathe.

In cœlio-hysterectomy the abdominal stitches should be retained as long as possible. The patient should not sit up until three or four weeks have elapsed; an abdominal belt should be worn for some time. Final recovery from Porro's operation is much longer than from cœlio-hysterectomy. The stump separates by sloughing, and the depression usually left must be filled by granulation. During this time infection may occur unless the stump is treated antiseptically.

In cases where the uterus is infected when abdominal section is performed the patient will have the best opportunity for recovery if the uterus be treated like a malignant tumor and entirely removed. If the fœtus is dead and partially decomposed, it is better not to open the uterus, but to remove the uterus without emptying it. The broad ligaments are to be ligated and cut; the uterine arteries must then be tied, and the uterus dissected from its attachment to the vagina. Antiseptic gauze should be placed in the pelvis, and, if possible, the pelvic peritoneum be brought together above the gauze. If this cannot readily be done, the gauze itself may serve to close the lower extremity of the abdominal cavity. The end of the gauze is brought out into the vagina and may be gradually removed, as is done after total extirpation of the cancerous uterus by abdominal section. If the abdominal cavity be freely flushed with hot saline solution, the abdomen should be closed without drainage, the gauze in the vagina providing for such drainage as is necessary.

Although this is naturally a grave operation, its mortality arises chiefly from the fact that occasion to perform it rarely arises except upon patients exhausted by fruitless labor and already thoroughly infected. Where the pregnant and cancerous uterus is removed in the same manner at or near term the recovery of the patient from the operation is not infrequent. Such patients require the utmost stimulation and careful feeding. The bowels should be moved by small doses of calomel followed by saline, or saline injections, and all the resources known to surgery should be employed to tide the patient over the first development of shock after the operation. If the case has been taken in time, it is possible for such a patient to recover.

CHAPTER VII.

EMBRYOTOMY.

By embryotomy is understood the delivery of the fœtus by lessening its size. The term may be directly applied to those forms of delivery in which the child is crushed or cut in such a manner as to enable the operator to remove it from the body of the mother. As the head most frequently presents, it is this portion of the fœtus most commonly crushed or pierced in performing embryotomy. Embryotomy when limited to the head of the fœtus is called craniotomy.

The positive indication for embryotomy is the presence of a dead child in the womb of a mother whose pelvis is too small to permit its extraction without lessening its size. If the fœtus be living and a monstrosity, if it cannot be born without operative interference, embryotomy is also indicated. The presence of a healthy, vigorous child,

uninjured by fruitless attempts at delivery, in a pelvis too small to permit its birth, does not indicate the performance of embryotomy, but calls for delivery by abdominal incision or symphysiotomy.

In deciding upon embryotomy, the physician may be placed in circumstances of peculiar difficulty. He may be called to a case where a vigorous, living child is contained in a pelvis too small to permit its birth. The parents of the child may positively refuse to allow delivery to be accomplished by either abdominal incision or symphysiotomy. If a consultation be summoned, the verdict of the consultation will be that the life of the child can be saved by abdominal section or symphysiotomy only. The parents not admitting this view, the attendant physician will be asked to destroy deliberately the life of the child in the interest of the mother.

In dealing with such a situation no attempt at evasion can be tolerated. When sufficient time has elapsed for the engagement of the head and the child has failed to enter the pelvis in any posture, and suprapubic manipulations have been tried without effect, and the child is manifestly so large that it cannot be brought through the pelvis without its destruction, it is dishonest to evade the issue by waiting until the child dies and then performing craniotomy. If the physician is alone in the case and no competent physician can be summoned to the assistance of the patient, the attendant physician must guard the mother's interest in preference to those of the child. He may sometimes obtain consent to an effort to save the child if the parents are members of a religious body whose tenets forbid embryotomy. If, however, he is the only physician available, and he cannot obtain consent to operate, he must throw the responsibility of the choice upon the parents and perform embryotomy under protest in the mother's interest. When, however, the physician is in a city or town where other practitioners of medicine can be obtained, he may properly decline absolutely to perform embryotomy and retire from the case, leaving with the parents the responsibility of calling another physician. The results of delivery by abdominal section or symphysiotomy are so favorable to mother and child that he is perfectly justified in declining to perform embryotomy upon living children in good condition.

The performance of craniotomy may be conducted by simply piercing the head, and allowing the pressure of labor-pains to empty the skull partially by forcing out its contents. The head may be opened in a suture or fontanelle by any pointed instrument available. Thus, a closed pair of scissors with sharp points may be thrust into a suture or fontanelle and the head be opened in this manner. This, however, is a very inefficient procedure, as the pressure of the brain within the skull often forces brain and membranes outward against the puncture and closes the aperture thus made. To perform craniotomy thoroughly the head must be opened by a suitable instrument making an aperture large enough to insert forceps with which traction can be made, and the head partially emptied by the pressure of the walls of the pelvis. The most thorough and complete craniotomy is performed with the obstetrical trephine, which removes a button of bone, permitting the thorough emptying of the skull and its delivery by suitable forceps.

To perform craniotomy the patient must be anæsthetized. The instruments necessary are a perforator or trephine, a good-sized piston-syringe, to which may be attached a rubber tube terminating in a firm metal tube, and a cranioclast; large, blunt-pointed scissors and uterine dressing-forceps; an abundant supply of hot water is needed, with creolin, bichloride of mercury solution, iodoform-gauze, bichloride of mercury gauze, and the proper appliances for closing the perineum. The patient is placed when anæsthetized upon her back at the edge of the bed or table. The external parts must be thoroughly cleansed with soap and water and bichloride of mercury solution, 1 : 2000. It is important that the bladder be thoroughly emptied and also that the rectum be emptied; the vagina and cervix require abundant douches of creolin, 2 per cent. The field of operation is to be surrounded with clean linen. The instruments of the operator must be cleansed with soap and boiling water and immersed in creolin or carbolic acid, 2 per cent. It is desirable to avoid exhibition of craniotomy-instruments, and hence a large toilet-pitcher may be cleansed and filled with creolin, 2 per cent.; the larger instruments may be placed in this pitcher, their handles up, and the pitcher covered with a towel until the instruments are required.

The head must be carefully mapped out and care taken to ascertain the position of the anterior parietal bone. In using the trephine it is advantageous to pierce the head at this region. If the scalp is œdematous, it may be necessary to cut through the scalp with a pair of scissors or a scalpel. Ordinarily, however, this is unnecessary. The fingers of the left hand should clearly locate the parietal bone and firmly hold the trephine, grasped in the right hand, against the skull. The straight trephine devised by Braun is the best instrument. The skull should be opened by the trephine and the button of bone removed. The closed uterine dressing-forceps should then be inserted and the membranes and brain thoroughly loosened. The contents of the cranium will then be washed out by the piston-syringe with bichloride solution, 1 : 8000, or creolin, 2 per cent. When the fluid returns clear, the head must be grasped with Braun's cranioclast, one blade being passed through the aperture in the skull and the other fitting over from without. The instrument is to be tightly screwed down upon the skull by the compressing screw at the end of the handle. Traction must be made with the cranioclast downward and backward, as with axis-traction forceps. This is made possible by the pelvic curve which the best instruments possess. Traction should be made, if possible, as with the forceps at the occurrence of pains. The head will be gradually compressed by the bony walls of the pelvis and will emerge drawn out into an irregular cone, the cranioclast being at the apex of the cone.

Some prefer the use of a bladed perforator, of which Blot's is the best. This instrument is introduced through a suture or through bone. The blades are opened, closed, and again opened at right-angles to the first incision. The result is an aperture made by turning back within the skull four flaps of bone. The skull may be fairly well emptied through this aperture and delivery effected by the cranioclast.

In cases where the base of the skull is especially hard and resisting it may be necessary to crush the head in addition to emptying it. For this purpose a pair of heavy obstetric forceps with a compressing-screw at the outer extremity of the handles is required. This instrument is termed a cephalotribe. Complicated instruments have been devised which combine the trephine with the blades of a cephalotribe, but such possess no advantage over more simple instruments.

The basiotribe is an instrument designed to combine the practical features of the trephine and the cephalotribe. It consists of a central stem terminating in a trephine or screw-perforator, while upon each side of the central stem are attached the blades of the cephalotribe. The instrument is used by boring through the vertex of the skull with the central perforator and then by applying the crushing-blades to each side of the head, and thus perforating and crushing the skull at once. The central perforator may even be carried into the base of the skull, thus obtaining a firm hold upon the cranium. While this instrument has been successfully used, it is complicated and to be found only in maternity-hospitals. Its use may well give place to more modern operations, which will relieve the mother at much less risk.

Next to the head, the shoulders of the child most frequently prevent its delivery. Unusual width of the shoulders is seen in very large children, and in those especially well developed in this particular. Should the head be delivered but the shoulders remain, the physician must first rotate the shoulders, if necessary, into one of the oblique diameters of the pelvic brim and pull strongly down upon the anterior shoulder by hooking his fingers into the axilla. Should he not be successful, however, in securing the engagement of the shoulders in this way, the clavicles may be severed by blunt-pointed scissors. This allows the shoulders to fall forward upon the chest, thus lessening the bisacromial diameter and permitting delivery to take place.

It may be necessary to open the throat of the child or its chest or abdomen by reason of a tumor or collection of fluid in one of these regions. This is best done by blunt-pointed, strong scissors, the left hand being introduced sufficiently far to act as an efficient guide.

In cases of contracted pelvis where the fœtus presents in breech presentation the body of the child may be born, but the head remain within the pelvis. It will then be necessary to perform craniotomy by piercing the skull in the occipital region or by entering the head in front of the larynx. In either case no especially complicated instrument is needed, as the operator can succeed with one of those already described.

The hydrocephalic head must be perforated when it is not readily delivered without such interference. If a large trocar is available, it may be thrust into the most accessible portion of the head, penetrating the skull and membranes covering the brain. If a trocar is not at hand, a small perforating-instrument will usually suffice.

The fœtus may become turned in a transverse position in the uterus and so firmly impacted that it cannot be dislodged, and hence decapitation must be performed. Of the instruments especially adapted to this purpose Braun's blunt hook is the simplest and best. It is bent

upon the handle at an angle, and operates by traction and with a side-to-side movement, caused by partially rotating the handle. If this be not available, blunt-pointed scissors may be utilized or a strong cord or flexible wire, such as copper, may be passed around the child's neck and the neck severed by a sawing motion. Complicated instruments for decapitation are not, as a rule, successful. Amputation of a fœtal limb may be performed by introducing the hand within the uterus, grasping the limb with the thumb and fingers, and cutting through with blunt-pointed, long-handled scissors.

Embryotomy is among the most difficult operations of obstetric surgery. The field of access for operation is so small, the operator is deprived of the assistance given by sight, and the patient is often in such a condition of exhaustion or infection that the results are frequently most unsatisfactory. Thorough antisepsis, patience, and skilful manipulation are required to succeed in these cases. The dangers to the mother are from injuries to the uterus, the bladder, intestine, and perineum. The uterus has been punctured by the operator in these cases, and other organs have been seriously injured. It is most dangerous to attempt embryotomy without the patient under surgical anæsthesia and without introducing the entire hand, if possible, to act as a guide.

The maternal mortality of embryotomy must always be high, as it is rarely an operation of election, but is usually forced upon the operator, and with an exhausted patient.

After the removal of the child the uterus must be thoroughly douched with creolin or carbolic acid, 2 per cent. The cervix, pelvic floor, and perineum should be carefully inspected to ascertain the presence of injury. If the condition of the patient will permit, extensive tears and lacerations of the pelvic floor and perineum should be immediately sutured.

In suturing tears of the pelvic floor and perineum, when the tissues have been severely bruised, especial precaution must be taken to secure a favorable result. Suture-material should be selected which is large in calibre and thus less likely to cut through the tissues. It should also be elastic and should not be drawn tightly. As healing will rarely occur by first intention, the suture-material must be such that it will remain unabsorbed sufficiently long to promote union. The function of the surgical stitch is to serve as a splint, holding the tissues together until union can result. This must be kept in mind in these cases.

Two sorts of suture-material are valuable for these cases. One is chromicized catgut and the other aseptic silk. Of these the more practical and reliable suture is silk. This should be large or medium size, not firmly twisted, but a rather loose web. If possible, stitches should be passed through sound tissue at the edges of the lacerations. The stitches should not be tightly drawn, no effort being made to secure absolute approximation. By observing these precautions the deeper tissues, which are the more important, will usually unite, forming a serviceable pelvic floor and perineum.

The after-care of these tissues is a matter of considerable importance. Where great swelling is present, hot douches, 110° F., of very dilute

antiseptic material, will give great comfort to the patient and greatly improve the condition of the parts. Bichloride of mercury solution, 1 to 8000 or 1 to 10,000, boric acid solution, a tablespoonful of the powdered acid and a tablespoonful of glycerin to the quart of hot water; carbolic acid, 1 per cent., with glycerin; thymol, 1 to 2000, or sodium chloride, two teaspoonfuls to the quart of water, may be used with good results.

To protect the granulating surfaces in such tissues it is well to powder them freely with an antiseptic powder such as boracic acid, sodium biborate, acetanilid, or iodoform and boric acid. As soon as the swelling and discoloration of the parts are largely diminished, douching may be omitted and the parts may be cleansed by the spray and freely powdered. If stitches cut severely, they should be removed; but if not, they should be allowed to remain from ten days to two weeks. Silk stitches, as a rule, are most reliable and will give the patient the least discomfort.

The patient should be given strychnine in these cases and ergot to secure uterine contraction. The bowels should be moved promptly on the day following the operation. The patient should be given stimulants and nutritious food at frequent intervals. The greatest care must be exercised in providing her with suitable antiseptic dressing and in maintaining her in an aseptic condition. If the bladder be irritable or there is reason to fear that the base of the bladder has been bruised or injured in the delivery, a soft catheter to which is attached a long tube should be left in the bladder for several days.

The mortality-rate of embryotomy for the mother is high, because most cases are not seen until the patient has been injured by efforts at delivery, and very probably infected with septic poison in addition. In selected cases where craniotomy is an operation of election the maternal mortality is practically *nil*. Cases of embryotomy for hydrocephalus are especially favorable for the mother, as the head is usually delivered with ease after it has been emptied.

The physician should take special care that the mother and her friends are not shocked by the sight of the child's body. This is especially the case with ignorant persons, in whom operation gives rise to exaggerated reports of the case. It is best, if possible, to place the child's body in a covered receptacle, and for the physician to carry it with him when he leaves the house.

CHAPTER VIII.

OBSTETRIC CURETTEMENT—OPERATIVE EMPTYING OF THE UTERUS.

In obstetric surgery it is frequently necessary to empty the uterus, completely removing not only the fœtus, placenta, and membranes, but also as much of the decidual lining of the uterus as possible. In all cases in which a suspicion exists that septic infection has occurred or in which there is reason to believe that the lining membrane of the uterus is in an unhealthy condition, precautions should be taken to empty the womb thoroughly when labor is completed.

The best instrument for this purpose is the finger, which can dislodge a portion of an adherent placenta or scrape away decidua, giving to the operator the information which a sensitive surface supplies. The finger, however, is seldom long enough to cover the internal surface of the enlarged uterus, and hence a substitute may be provided. This is found in the obstetric curette. In order to perform this operation successfully the condition of the puerperal uterus must be taken into consideration. The uterine sinuses are closed by recently formed thrombi which plug the openings left after the separation of the placenta. These serve a double purpose, not only to prevent bleeding, but also to exclude infective material from without. If, however, these thrombi be removed by a curette, there is danger of bleeding, while septic infection, if present in the uterus, gains direct access to the circulation. The uterine decidua is a membrane which is discharged in normal cases by necrosis without infection. Beneath this membrane at its base lies connective tissue, which serves as a barrier for any infective agent which might otherwise pass the cells of the decidua. In completely emptying the uterus it must be remembered that the operator does not desire to penetrate further into the uterine tissues than to remove the decidua. This is best accomplished by a blunt curette, which will not remove the thrombi closing the sinuses, thus opening fresh channels of infection. The obstetric curette should be considerably longer than that employed for the non-puerperal uterus. It may also combine to advantage the function of a douche-tube by having a hollow stem through which an antiseptic fluid may pass, freely irrigating the uterus during the process of curetting.

In selecting an antiseptic fluid for this purpose carbolic acid or one of its derivatives is to be preferred to bichloride of mercury. There is undoubted evidence that bichloride solutions used within the uterus may occasion mercurial poisoning. Carbolic acid, 2 per cent., or creolin, 2 per cent., is most convenient for this purpose.

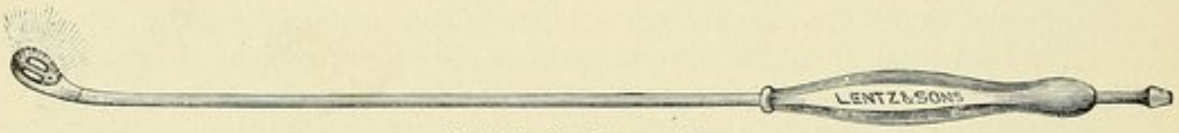
To empty the uterus thoroughly, if the operation be done at labor, an anæsthetic is often necessary. If the patient has been delivered under anæsthesia, curetting may be done before she awakens thoroughly.

If the operation be done during the puerperal state, it is best to avoid the use of an anæsthetic if possible. If it is requisite, however, ether should be chosen.

The operator will require for this operation an obstetric curette with hollow stem to which may be attached the hose of a large fountain-syringe or irrigator. A gallon of hot carbolic acid solution, 2 per cent., or creolin should be in readiness. Antiseptic gauze in a strip four inches wide and a yard long should also be at hand, while curved uterine dressing-forceps will be required.

The patient is placed upon her back at the edge of a bed or table, the bladder and rectum emptied, the external parts thoroughly cleansed with bichloride of mercury solution, 1 : 2000, and a copious vaginal douche of creolin, 2 per cent., is given.

FIG. 189.



Obstetric douche-curette.

The field of operation is surrounded with clean linen. Having thoroughly cleansed his hands and instruments, the operator inserts the fingers of the left hand behind the cervix to act as a guide. The curette is attached to an irrigator and the fluid allowed to flow. The curette is then introduced along the fingers of the guiding-hand and gently inserted into the os and cervix. The interior of the uterus is to be thoroughly scraped with the curette, without, however, the exercise of force, while the antiseptic fluid thoroughly irrigates the interior of the womb. As the patient has been placed for this operation upon a rubber sheet or rubber pad, the antiseptic fluid will run over this rubber sheet into a bucket or jar placed beneath the edge of the bed.

FIG. 190.

Rubber intrauterine douche-tube.

While the scraping is going on the operator can examine the fluid as it runs out and note the presence or absence of pieces of placenta, membrane, or decidua. When the uterus has been thoroughly but gently scraped with the curette until the fluid comes back clear, the curette may be removed and the uterus tamponed with antiseptic gauze. The end of the gauze should be left protruding from the cervix. The vagina should then be tamponed with bichloride of mercury gauze and an occlusion-dressing and a bandage placed over the vulva.

The vaginal dressing should be changed when stained through, while the gauze within the uterus may remain for twenty-four or thirty-six hours. When removed it should be done with thorough antiseptic precautions. The vagina should be douched with bichloride, 1 : 4000, as soon as the gauze is removed, followed by an intrauterine douche of

carbolic acid or creolin, 2 per cent. In cases where the uterus is large and flabby it is well to give ergot and strychnine until the condition of the womb and patient's general health are greatly improved. It is well to move the bowels on the day following the operation. The after-care of the case is that usually given to normal puerperal patients.

It is rarely necessary to repeat curetting of the uterus, although in septic cases, where the lochia become foul, it may be best to curette the uterus a second time within thirty-six hours after a first curetting. If excessive pain be complained of after the operation, it may often be relieved by applying a hot turpentine stupe over the abdomen, or by a prompt emptying of the intestines through high injections.

It occasionally happens in cases where the uterus has been thinned and weakened by repeated pregnancy that a curette is thrust through the wall of the womb, entering the peritoneal cavity. If infection be carried into the peritoneal cavity, the accident will result seriously, as peritonitis will develop. If, however, no septic infection be carried through the wall of the uterus, the accident is not a grave one, as many patients show no effect whatever from this complication. Should perforation of the uterus occur, it is well to avoid douching the uterus, because of the danger that an irrigating fluid might pass through the aperture into the peritoneal cavity.

If the uterus is high in the abdomen, it may be gently pressed down by an assistant or by one hand of the operator. The movement of the curette within the womb can best be appreciated by the hand of the operator placed over the fundus.

SECTION IV.

ABORTION—EXTRAUTERINE PREGNANCY—THE PUERPERAL STATE.

CHAPTER I.

ABORTION AND PREMATURE LABOR.

By the term abortion is understood the expulsion of the ovum before the period of viability. When the fœtus is born after it becomes viable, but before the normal termination of pregnancy, it is known as premature labor. In the language of patients, abortion is seldom used on account of its frequent criminal association. Women commonly speak of any premature expulsion of the ovum as a miscarriage or premature labor.

The causes of abortion are those which pertain to the mother or father and those which pertain to some portion of the ovum itself. The most frequent parental cause for abortion is syphilis. This may affect either the ovum or the mother, or both. In either event it so changes the lining membrane of the womb as to prevent the usual adhesion of the ovum to the wall of the uterus, the result being that the ovum becomes separated and is expelled. Constitutional disease on the part of the mother which severely affects the nutrition of the uterus may also result in premature separation of the ovum. Thus, lead-poisoning, severe malarial intoxication, disease of the bloodvessels, often seen with nephritis, or tubercular infection of the uterus, may result in abortion. Direct violence to the mother by a fall or a blow, by excessive coughing or straining, or by some direct disturbance of the uterus may also cause separation of the ovum and abortion.

On the side of the ovum, bleeding into the ovum, known as apoplexy of the embryo, cystic degeneration of the villi of the chorion, syphilis or tuberculosis, and toxæmia of the mother affect the placenta and may cause premature expulsion of the ovum.

The signs of abortion are contraction of the uterus, generally causing pain, with hemorrhage. Dilatation of the cervix will sooner or later occur, although at first the mouth of the womb may not open until a considerable amount of blood has collected within its cavity. If no interference be practised and uterine contractions continue, the mouth of the womb gradually opens and the embryo and its appendages are expelled. Before the fifth and sixth months the embryo is often expelled entire, while after that time the membranes commonly rupture and birth occurs very much as at term.

By incomplete abortion is understood the retention within the uterus

of a portion of the embryo. As this is soon cut off from its blood-supply it will end in necrosis. This affords a most favorable culture-ground for germs, and should infection occur a most serious complication will be added.

By therapeutic abortion is understood the emptying of the uterus before the embryo is viable, to rescue the mother from a diseased condition aggravated by pregnancy.

In treating abortion the expulsion of the ovum must occur if considerable hemorrhage has taken place. All measures, then, intended to check abortion can be successful only in the absence of severe bleeding and continuous uterine contraction. The physician must determine carefully whether it is best to attempt to delay the expulsion of the ovum, as the case is rendered more complicated by anodynes after the death of the embryo has occurred. If a patient be taken with pain and slight hemorrhage, she must be put at once at rest, free from every sort of disturbance, and placed as soon as possible under the influence of opium, or, if this cannot be taken, of some other anodyne. If the abortion can be prevented, the uterine contractions will cease, the bleeding will stop, and the patient will usually drop asleep. Unless this result follows within a few hours from the beginning of the treatment, hope of delaying the abortion should be abandoned and measures should be taken to secure the entire expulsion of the ovum. Little reliance can be placed upon cooling drinks and on many other expedients often described.

While it is possible to anæsthetize the patient, dilate the womb, and curette away the ovum, still it is rarely necessary to complete abortion in that manner. The mother is threatened during abortion with two dangers—one is hemorrhage and the other is septic infection. Any form of treatment which successfully secures the entire expulsion of the ovum must also guard against these dangers. This can be accomplished by the proper use of the antiseptic tampon.

To apply this form of treatment the vagina should be thoroughly douched with bichloride of mercury solution, 1 : 4000. The patient should be placed upon her back or side and the perineum and pelvic floor pressed downward and backward by a speculum or by the fingers of the operator. A strip of antiseptic gauze four inches wide and a yard long should be thoroughly packed about the cervix with uterine dressing-forceps, the end of the gauze being carried through the cervical canal by the finger if possible. The presence of this tampon serves to bring about the desired result in several ways. The pressure which it exerts against the os and cervix stimulates uterine contraction, while the presence of the gauze within the cervix tends to further the dilatation of the part.

The expulsion of the ovum may also be hastened by the administration of ergot in small doses, fifteen drops every hour. In many cases under this treatment uterine contractions gradually increase in strength until the tampon and the embryo are expelled together. In other cases the operator removes the tampon to find the embryo adhering to the end of the gauze. If properly applied, the gauze makes efficient pressure, and hemorrhage need not be feared unless the uterus dilates with

great rapidity or unless the staining of the dressing with bright blood indicates the necessity for the renewing of the tampon.

By complete abortion is understood the expulsion of the ovum entire. The question as to whether the abortion is complete or incomplete can only be positively determined when all the discharges from the uterus have been subjected to careful examination. The physician should ask for all soiled napkins or blood-clot which the patient has passed, and if these be soaked in cold water portions of an embryo may be readily recognized. It will often be found that an abortion which might be supposed from the number and size of blood-clots expelled to have been complete, is not so, but that a portion of the ovum still remains within the uterus. In early abortion, if a blood-clot containing an ovum be put into cold water, the clot will gradually dissolve and the fringe formed by the villi of the chorion can be detected.

In many cases of abortion it is not possible for the physician to obtain the opportunity to examine all of the discharges. Clotted blood is usually thrown out by those who do not understand the importance of such examination, while soiled napkins may be washed or burned. In such cases, before the physician leaves his patient under the supposition that the abortion is complete, he should satisfy himself that such is the case by examining with the finger the interior of the uterus. If the vagina be thoroughly douched immediately after the expulsion of the embryo, the uterus may be carried downward into the pelvis by suprapubic pressure, while one or two fingers of the aseptic hand may be carried within the uterus and thoroughly explore its cavity. Blood-clots remaining within the womb should be removed, and the finger can ascertain whether the interior of the uterus is empty and smooth, or whether a portion of the ovum is still adherent to its wall. If the latter be true, it should be removed by the finger if possible; but if this cannot be done, the uterus should be emptied by the use of the curette.

It may seem that such exploration of the uterus is unnecessary interference, but, in view of the dangers following the retention of a portion of the ovum, it is far safer to examine more thoroughly under antiseptic precautions than to allow a portion possibly to be retained.

Incomplete abortion is dangerous by reason of the portion of the embryo retained within the uterus; but often this complication may be successfully dealt with if septic infection does not occur. Cases arise in which the placenta may be adherent to the wall of the uterus so firmly that the finger and blunt curette cannot completely remove it. In these cases it is better to use no violence in removing retained tissue, but to make the uterus aseptic and maintain the birth-canal in an aseptic condition until the placenta becomes dislodged by necrosis of the cells of the placenta and uterine decidua. This is to be accomplished by thoroughly douching the uterus with carbolic acid or creolin, 2 per cent., tamponing it with iodoform-gauze and tamponing the vagina with bichloride of mercury gauze, 1 : 2000. The external parts must remain covered by an antiseptic occlusion dressing and be thoroughly cleansed with bichloride solution, 1 : 4000, after each micturition and defecation. In from thirty-six to forty-eight hours in the majority of cases the placenta will be found loosened and will often be

Abortion (Fœtus and Placenta) at Eighteen Weeks.

Actual size, 20 cm. long.

expelled by the contractions of the uterus. Care should be taken that the womb is maintained in a condition of firm contraction by ergot, fifteen drops every six hours, with strychnine, $\frac{1}{60}$ grain, every six hours. The tampon of iodoform-gauze may remain for forty-eight hours in the uterus, but the tampon of bichloride gauze should be renewed in the vagina daily. If thorough antisepsis be practised, the placenta will be expelled or may be removed without danger to the mother. (Plate XII.)

The most dangerous forms of abortion are those termed criminal abortions. They are commonly practised by ignorant persons who know nothing regarding septic poisoning. Any convenient article may be used in an endeavor to rupture the membranes; thus knitting-needles, hairpins, pieces of wire, short sticks, scissors, pieces of whalebone may be employed. Professional abortionists commonly use the uterine sound. They often use a speculum, and their instruments are rarely, if ever, properly sterilized. Injections of irritating substances are often employed for this purpose. Very hot water, vinegar, turpentine, and other irritating solutions are frequently used. An effort is sometimes made to force the finger through the cervix and into the uterus, forcibly dilating the womb.

In dealing with cases of abortion in which the slightest suspicion of criminal interference exists the physician should examine his patient with great care, making complete notes of any history obtained from the patient or those present about her, and also noting carefully the results of his physical examination. Unless he is positive that the attempt at abortion has been a failure, he should proceed to cleanse thoroughly the interior of the uterus and the entire genital tract. The uterus should be rid of septic infection in the manner described. Clots and portions of an embryo must be carefully kept for examination, and thorough douching and curetting should be employed wherever necessary. If positive evidence of criminal abortion is present, the physician should at once report the case to the proper authorities, placing all evidence in his possession at their disposal. This is especially important in fatal cases, in which the abortionist often abandons the patient, thus endeavoring to place responsibility for death on a reputable physician. Suspicious cases of death with symptoms of abortion should be made coroner's cases and a post-mortem examination held. If physicians will take the trouble to co-operate with the health authorities by promptly reporting cases, much can be done to prevent criminal abortion.

Cases of criminal abortion which are seen for the first time several days after the abortion may readily deceive the attending physician regarding their nature. Symptoms of inflammation in the pelvis, peritoneum, and cellular tissues are often present, and may completely mask the signs of recent abortion. So frequently is this the case that in examining all cases of septic infection in the pelvic cavity abortion must be excluded as a cause in making accurate diagnosis. Such cases are especially dangerous by reason of the insidious progress of septic infection, and require the most prompt and thorough surgical treatment. The patient may be apparently progressing rapidly to recovery

when an abscess in the tube or ovary or broad ligament may burst, followed by rapidly fatal absorption. In large cities cases of criminal abortion furnish the most pronounced types of puerperal septic infection.

Therapeutic abortion is performed in the interests of the mother whose life is in danger by reason of pregnancy. This procedure is justifiable in cases of nausea and vomiting, where rapid anæmia threatens the mother; in cases of acute wasting disease, as tuberculosis; and in rare instances of melancholia and hystero-epilepsy; in toxæmia it is also indicated after appropriate treatment of other sorts has been tried.

The patient should be prepared for the operation of abortion in a thoroughly antiseptic manner. She should, if possible, be given a bath, the bowels be thoroughly emptied, the bladder be emptied, and the external genital organs cleansed with soap and water and with bichloride of mercury solution, 1 : 2000. The field of operation must be surrounded with clean linen. The vagina is to be douched with carbolic acid or creolin, 2 per cent. For the performance of this operation surgical anæsthesia, preferably by ether, is required. The physician will need a pair of double-bladed tenacula, a bladed uterine dilator, solid dilators, an obstetric curette, a curved uterine dressing-forceps, and antiseptic gauze. The patient should be placed upon her back or side at the edge of the bed or table, and the cervix seized with the tenaculum-forceps and drawn gently downward and backward. If the uterus be anteflexed, it is well to seize the anterior lip of the cervix; while if the womb be retroflexed, the posterior lip should be grasped. In this way the cervical canal will be partially straightened and the uterus emptied more easily. When the uterus has been fixed by the forceps a gentle effort should be made to pass the tip of the index-finger through the os and cervix. If this can be done, the bladed dilator need not be used, but the womb may be opened by employing the solid dilators in graded sizes. Dilatation should be practised slowly and carefully, care being taken to avoid injuries to the tissues. It is of value to have the uterus pressed gently downward by suprapubic pressure at the hands of an assistant. Dilatation should be carried sufficiently far to permit the introduction of the obstetric curette and also of the gauze drain. When this is accomplished the uterus should be thoroughly emptied by the douche-curette and tamponed with iodoform-gauze. The vagina should be tamponed with bichloride of mercury gauze, 1 : 2000. An occlusion-dressing must be worn and the patient treated antiseptically in the usual manner. If thorough antisepsis be practised, therapeutic abortion adds but little to the risks of the mother if carefully done. Otherwise, it is often more fatal than the disease from which it seeks to deliver her.

Other methods of producing abortion are in use. The most efficient are those which seek to dilate the uterus and excite uterine contraction. Such are the use of laminaria tents, dilatation with gauze-tampons, or by the use of the finger or bladed dilators. The best of these is the employment under antiseptic precautions of the gauze-tampon, aided or preceded by dilatation with the finger.

Abortion is sometimes produced by rupturing the membranes, which

allows the amniotic liquid to escape and is followed by uterine contractions. The administration of ergot, frequent hot douches, and the use of electricity are also practised for the same purpose. It is extremely doubtful if any drug when given in doses not sufficiently large to produce poisoning has the power to bring on abortion in a healthy patient. Remarkable cases are on record in which women have taken many times the ordinary dose of ergot, quinine, and other drugs supposed to cause abortion, without success. Secret preparations sold for this purpose are useless in healthy patients unless taken in such quantities as to produce irritant poisoning. One of the most commonly used of these preparations is the oil of tansy. If delay must be avoided, the production of abortion is best accomplished when conducted as a surgical procedure. If haste is not imperative, gradual dilatation under antiseptic precautions by the gauze-tampon, aided by uterine contractions, stimulated by ergot or quinine, is an efficient method. Others may be successful, but cannot be depended upon, and are attended with greater risk.

By habitual abortion is meant repeated abortion occurring at the same period of gestation. The name implies that habit forms an important element in producing abortion in these cases. If such be carefully studied, it is usually found that some condition exists which prevents the growth of the uterus beyond a certain point, thus obliging the womb to empty itself at that time.

These cases are common in women who have retroverted wombs, and, if the displacement be corrected, pregnancy may go on to its normal termination. Anterior displacements of the uterus are not so apt to cause habitual abortion. In highly neurotic patients no anatomical cause may be found for habitual abortion.

In these cases removal of the cause prevents recurrence of abortion. In patients in whom no cause can be found the patient should be kept perfectly quiet for a month before the usual time for abortion, and care be taken that no irritating cause exists for the termination of gestation. Proper feeding, tonics, and good sense are required to carry these patients to a successful conclusion of pregnancy. A fixed belief on the part of the patient that abortion will surely occur at a certain date should be prevented if possible. Sedatives are useful in these cases for a short time only, and preferably at the period when menstruation has formerly been present. When such persons pass the period of former abortions especial care must be taken at times of menstruation, as danger is greatest at these periods.

It is especially important that patients recovering from abortion should take every precaution to secure a complete recovery before returning to their usual avocations. Abortion is often considered a trivial matter, and the patient is strongly tempted to be up and about in a few days, or at most ten days or two weeks, after this accident. The conditions, however, for perfect recovery are far less favorable than after delivery at full term. The uterine muscle is but partially developed, and hence contraction and retraction of the uterus are very imperfectly performed. The decidual membranes are not ready to separate from the wall of the womb, and hence the condition of endometritis

is readily set up. It is very rare for an abortion to be absolutely complete, and retained decidua or chorion may remain within the womb. In rare cases only the chorion is discharged, and the embryo may be retained for some time in the uterus. The hemorrhage which occurs during abortion is often greater than that which accompanies a well-conducted normal labor. In addition to these factors the mental condition of the patient is usually that of depression. If the abortion is a criminal one, the circumstances are all unfavorable for recovery; while if it occurs in a married woman, the unhappiness of disappointment is added to physical burdens. When these factors are taken into consideration it is readily seen that, even if infection is avoided, the patient after abortion requires quite as much care and quite as long a time to secure recovery as after labor. While physicians cannot control their patients in many of these cases, still it remains their duty to endeavor earnestly to secure proper attention to these cases.

The cause of premature labor may be found in mental or physical disorder on the part of the mother, or some disease which disturbs her power of oxygenation of the fœtal blood, or in an affection of the fœtus which interferes with its nutrition or causes its life to cease.

The symptoms of premature labor are uterine contractions, a gradual opening of the womb, and the phenomena observed in normal labor. As the tissues of the cervix are not in the physiological condition present at the normal termination of pregnancy, the first stage of labor may be prolonged. If the membranes are retained unbroken until dilatation is complete, labor is usually easy because the child is small. If, however, the membranes rupture early in the labor, the birth may be tedious and exhausting to the mother.

In cases of premature labor manipulations within the uterus are often more difficult than in cases at term. The uterus being imperfectly developed is less elastic than in normal cases, the fœtus is often friable and is easily ruptured, while the entire birth-canal is much less dilatable than at the end of gestation. It is often much more difficult to extract a small and partly macerated fœtus from one of these cases than in a patient at full term.

When dilatation is but partially complete the use of the elastic bag or the intrauterine tampon of aseptic gauze will be found of great advantage. If the fœtus has perished, there is no hurry because of the endeavor to secure a living child. It is better for the operator to take time to secure full dilatation than to do violence to the womb in an unsuccessful attempt to remove entirely a small fœtus.

The treatment of premature labor consists in the usual precautions taken in normal cases, while especial care is needed to avoid a rupture of the membranes. The fœtus may be expelled and the placenta retained by firm contraction of the uterus. If no hemorrhage is present and the patient be kept in an antiseptic condition, delay may be practised until the uterus expels the placenta. If, however, the placenta is partially separated and bleeding occurs, the patient must be anæsthetized, the uterus dilated, and the placenta completely removed.

Should the child live after premature labor its care requires skill and patience. If threatened with exhaustion, it should be placed in an

incubator and kept there until it has arrived at the usual term of birth. If the child is too feeble to suck, it may be fed with a pipette with breast-milk pumped from the mother's breast. Such children must be bandaged in cotton, and care taken to avoid exposure to cold and unnecessary handling.

With these precautions many prematurely born children may be saved. In cases where the child cannot swallow it may be necessary to introduce milk into the stomach through a small, soft catheter, to which is attached a small funnel. This, however, is rarely needed, as the child will usually take milk by the pipette.

By these methods of treatment the age of viability for prematurely born children has been advanced to six and one-half months.

There remains in the minds of many persons an abstract tradition which has no basis in fact regarding the vigor and chances for life of children born at seven and eight months respectively. For no good reason there exists a belief that a seven-months child is more likely to survive than is an eight-months infant. The source of this belief is not easy to trace, except for the fact that many premature births happen at about seven months, and that the number seven is curiously attached to several traditions regarding reproduction and descent. It is obvious that the longer the fœtus remains in the mother's womb without injury or disease the more perfect will be its development and the greater must be its vigor. Many children are born at eight months who are not recognized as premature children. Such infants, in the majority of cases, survive, and because their premature birth is not recognized they are not compared with children born earlier in gestation. The duration of pregnancy differs so greatly in different patients that many children considered at full term would be found on critical examination to be really prematurely born.

Obstetrical Operations in Private Houses.

In performing obstetrical operations in private houses an operator will often be embarrassed by reason of the lack of those facilities which make operative work so successful in hospitals. He cannot avail himself of sterilizing apparatus, while the appliances at his disposal are often of the most imperfect character. In this work it is safest not to trust to sterilization done in private houses, but, if possible, to bring with him his instruments, ligatures, and dressings, all ready in a sterilized condition. This can best be secured by the use of portable sterilizers containing trays in which instruments may be sterilized at the physician's office and taken to the patient's house, the trays not being opened until the operation. Dressings may be prepared in a similar manner and taken in sealed packages with the instruments. The ligatures are similarly treated. An efficient and simple operating-table can be devised by using one or more ordinary kitchen tables covered with a blanket, and over that a mackintosh or rubber sheet. Prepared sponges must be brought with the operator, or sterile gauze may be employed for that purpose. Stimulants required for operation form a necessary part of the personal equipment of every operator. Three or

four toilet bowls with their pitchers may be thoroughly cleansed with soap and water and easily made aseptic. An abundance of water which has been boiled is needed for solutions. In this way the operator is largely independent of his immediate environment, and may be prepared to answer a summons at any time to operate upon an obstetric patient in her dwelling.

The most complete apparatus for sterilization is necessarily somewhat expensive and bulky. The practitioner of general medicine is rarely in the possession of such articles. He need not, however, give up the attempt to secure proper asepsis, but can accomplish his purpose with the simple appliances found in any clean house. An abundance of boiled water is an absolute necessity. Instruments may be scrubbed with soap and water, and thoroughly rinsed and placed in a scalded earthen or tin bowl and boiling water poured upon them. When this water is sufficiently cooled to permit the instruments to be handled, they may be used directly from these bowls. Dressings may be made thoroughly antiseptic by wringing them out of bichloride solution, 1 : 2000. Needles may be threaded, placed in a small, clean earthen bowl and boiling water poured upon them. The family teakettle is a most useful piece of apparatus in these cases. Old linen which has been boiled may be torn up into convenient pieces for sponges or absorbent material. If necessary, the operator should take with him a fountain-syringe and one or two good-sized pieces of rubber sheeting. In this way the essentials of antisepsis can be thoroughly carried out without complicated apparatus.

It is often very difficult to obtain competent assistance for obstetric operations in dwellings. No surgeon would think of anæsthetizing a patient and performing a serious operation without medical help, and yet the obstetrician frequently anæsthetizes the patient, gives the anæsthesia in charge of the most intelligent available person, and proceeds to make a difficult version or forceps delivery unaided. In want of proper assistance the operator is often troubled with the difficulty of keeping his patient in a proper position for a difficult delivery. If he has a good leg-holder of any form, he will find it most useful. If he is not possessed of such an article, a long sheet may be taken, folded several times, passed beneath the knees of the patient and in front of her arm-pits, and about the back of her neck. If the lower extremities be well flexed upon the abdomen, they can readily be kept in this position by the sheet with but little inconvenience.

Obstetric operations should be made as little formidable as possible to the patient and her friends. A complicated labor naturally causes great anxiety and often fear to the patient and her family, and all unnecessary display of apparatus and instruments should be avoided. It is usually sufficient to tell the patient that the physician is going to help her to the completion of her labor. Spectators are useless in such operations, and only those nearest the patient, and especially those who can render assistance, should be present.

While it is useless to describe obstetric operations in detail to those who are not medical patients, still a clear understanding should be reached with the patient or her husband or nearest friend regarding

the indications for operation and its probable result. In this way much unjust criticism may be avoided.

The after-treatment of these cases, where skilled nurses are not available, entails oftentimes great labor upon the physician. He must often catheterize the patient himself and give necessary douches. He must see the patient at those hours when a change in her condition would be most likely to occur, and in general he must play the part of doctor and nurse also. He will often find it impossible to secure accurate records of what transpires in his absence, but the effort should be made as vigorously as possible. In lack of proper nurses he must perform all manipulations which might infect the patient if done with unclean hands, and the most that he can hope for from the friends and relatives is that they will avoid touching the genital canal of the patient. In all fatal cases every effort should be made to secure a post-mortem examination, in order that the cause of death may be clearly ascertained and that unjust criticism may be avoided.

In attempting to secure proper care for an infant born after a complicated labor the difficulty of the case is very great. If it is necessary to feed the child by gavage or even with a medicine-dropper, the physician must carefully instruct the caretaker of the child. For feeble children an incubator may be improvised by taking an ordinary clothes-basket and partially filling it with blankets and with heated flat-irons or bottles of hot water.

The matter of diet for these cases is often exceedingly difficult, and the physician must be competent, if necessary, to give written directions for the preparation of his patient's food.

CHAPTER II.

EXTRAUTERINE PREGNANCY.

EXTRAUTERINE pregnancy, or ectopic gestation, is that condition of the patient in which the impregnated ovum is contained outside the cavity of the uterus. The location of such an ovum may be within the cornu of an imperfectly developed uterus, within the Fallopian tube, where it passes through the body of the uterus, or in the tube itself. By rupture of the tube the ovum may lodge and grow between the folds of the broad ligament, gradually extending upward behind the peritoneum or within the peritoneal cavity among the intestines.

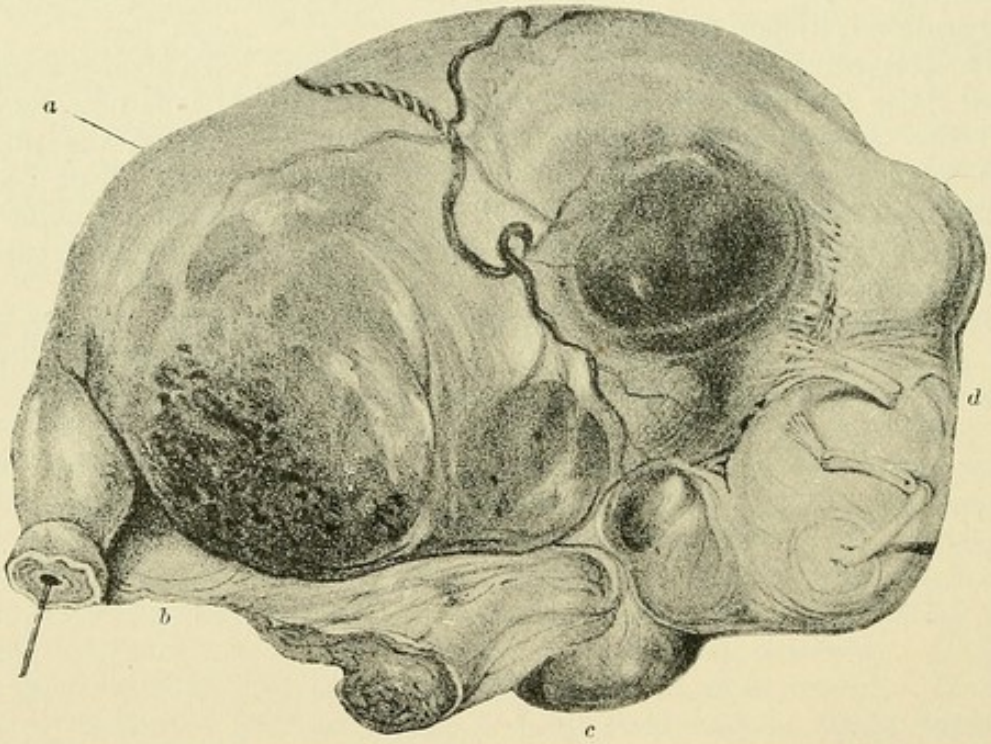
The cause of an abnormal location of the impregnated ovum is not clearly known. Primigravidæ and multigravidæ are subject to these complications. It has been asserted that it is most common in women who have had inflammation of the lining membrane of the Fallopian tube. This, however, is not clearly established, for there are reasons

for believing that inflammation of the lining membrane of the Fallopian tubes would render it impossible for the ovum to lodge in that portion of the genital tract.

The signs and symptoms of extrauterine pregnancy are cessation of menstruation, changes in the breasts characteristic of pregnancy, slight enlargement of the uterus, the discharge from the uterus of shreddy mucus, and the progressive growth of a tumor in the pelvic cavity.

The changes in the uterus in these cases differ markedly from those which occur in normal pregnancy. The enlargement of the body of the womb is much less. The cervix remains longer and less soft than in normal cases. The womb does not continue to enlarge in these patients, but remains stationary in size after the third or fourth month.

FIG. 191.



Unruptured tubal gestation with apopletic ovum. (CULLINGWORTH.)

a. Tube distended with clot. *b*. Ovary in section. *c*. Cyst. *d*. Fœtus in sacculus of tube, limbs protruding.

To establish a diagnosis of extrauterine pregnancy the physician must positively ascertain that the patient is pregnant; that the uterus is empty, and that its lining membrane does not show the characteristic changes of normal pregnancy; and that a tumor is developed within the pelvis. To establish these facts an examination under anæsthesia is often required. When the patient is anæsthetized the opportunity should be taken to examine the cavity of the uterus with a flexible probe or sound, and to scrape away some of its lining membrane for microscopic examination. Under thorough antisepsis and skilful manipulation this can be accomplished without risk to the patient. Anæsthesia will also aid greatly in the discovery of a pelvic tumor. The rectum

PLATE XIII.

FIG. 1.

FIG 2.

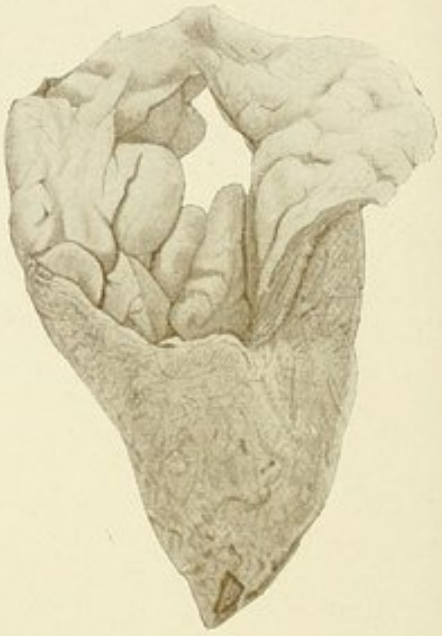


FIG. 4.

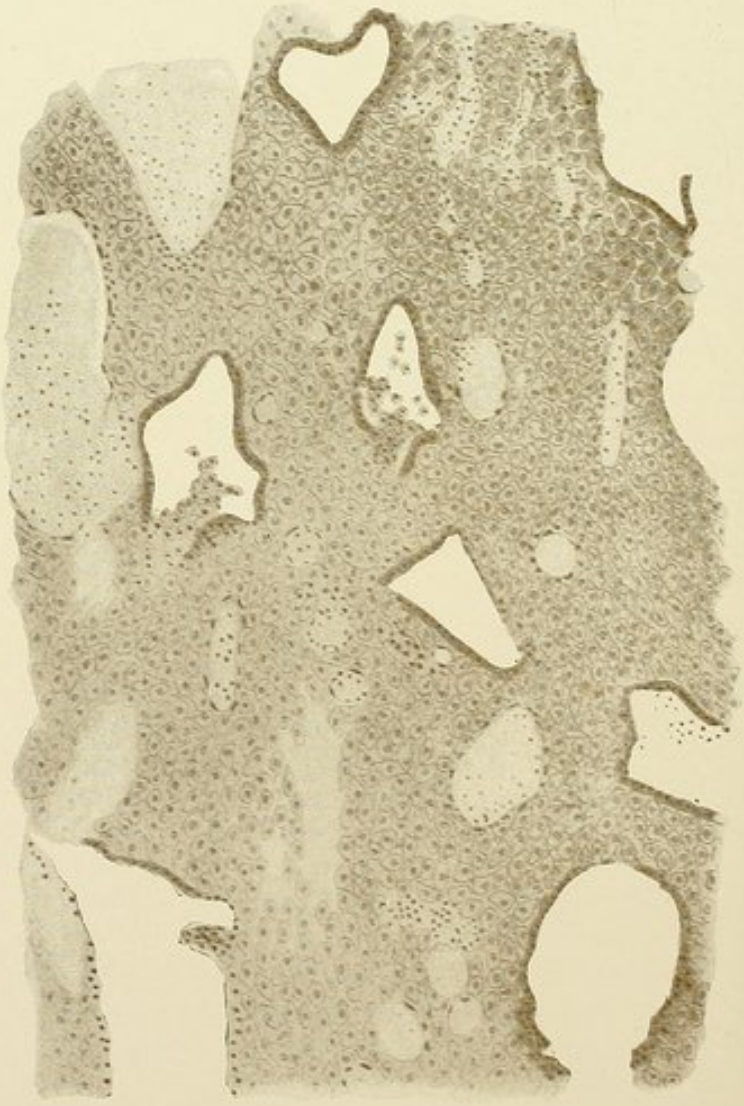


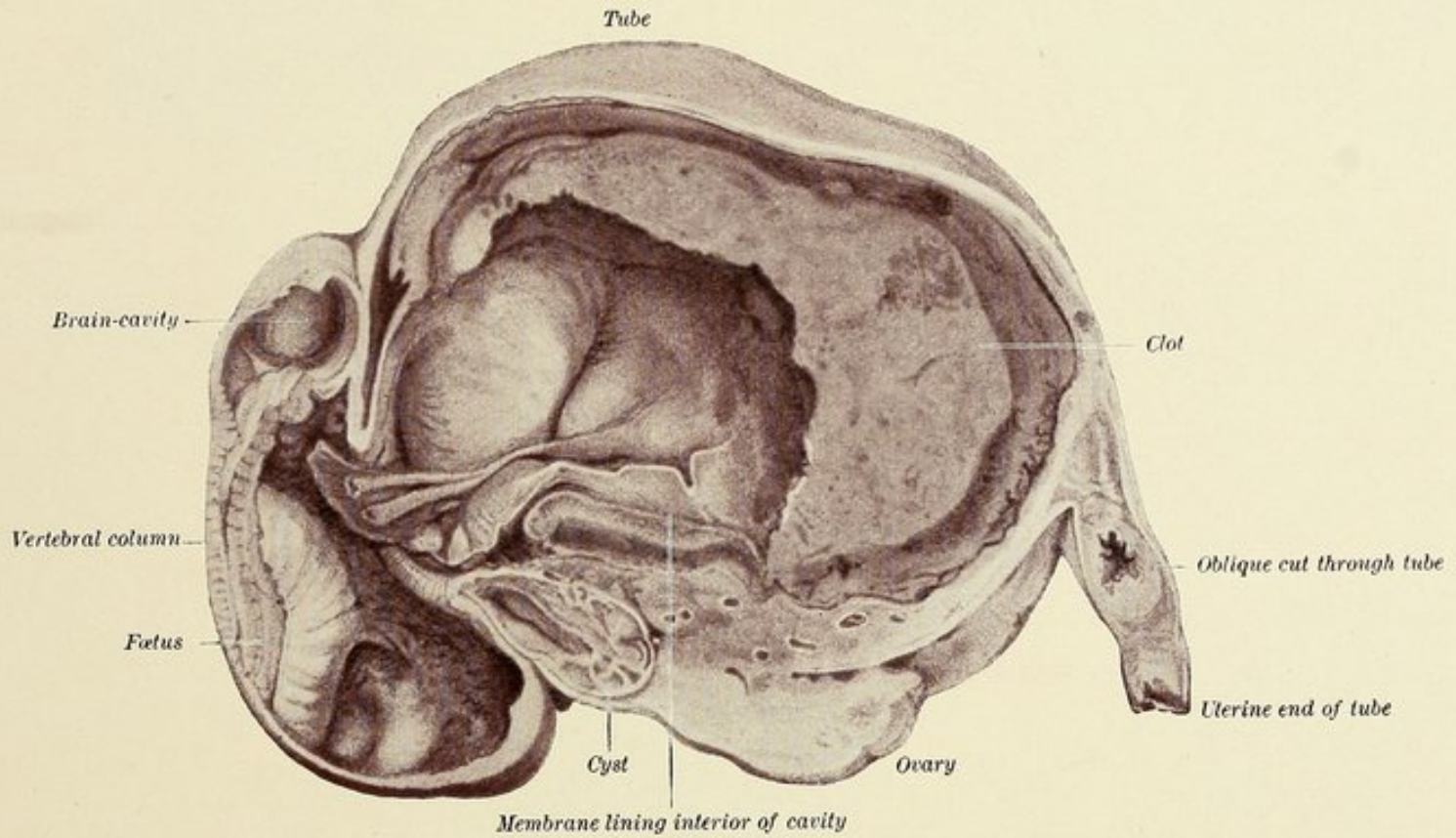
FIG. 3.

Ectopic Gestation. (ZWEIFEL.)

Figures 1, 2, 3, uterine decidua as expelled from uterus.

Figure 4, characteristic decidual cells.

PLATE XIV.



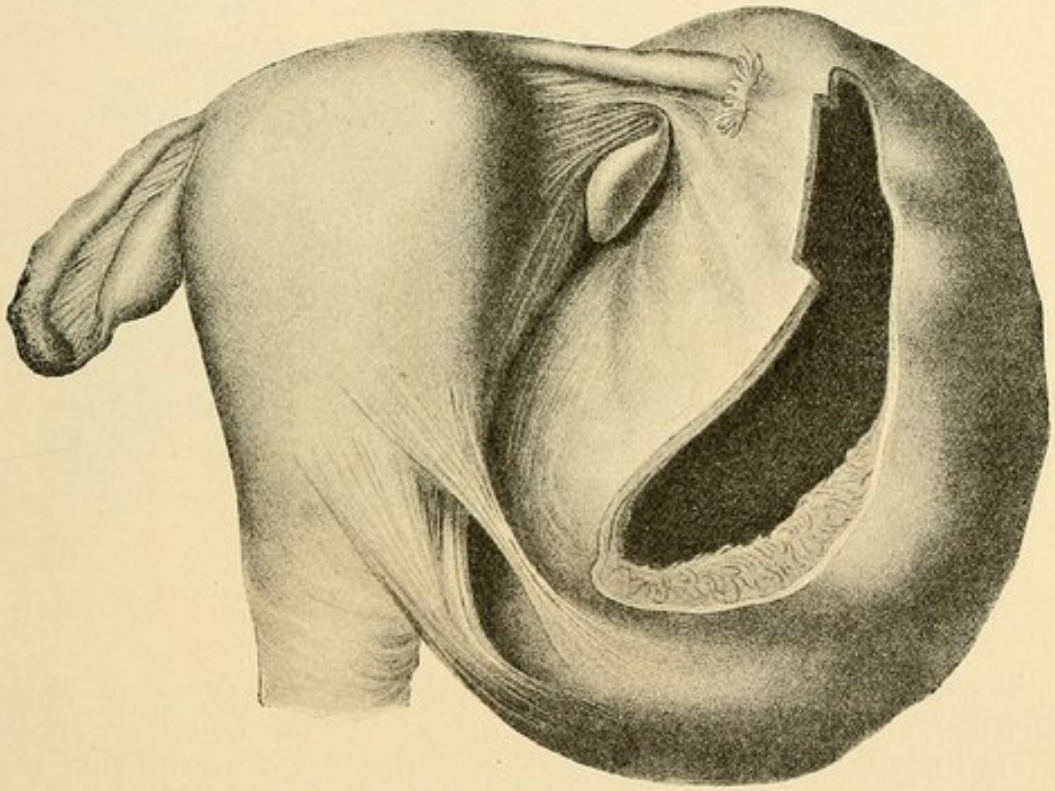
Unruptured Tubal Gestation, with Apoplexy of Ovum. (CULLINGWORTH.)

and bladder must be thoroughly emptied before such an examination. (Plate XIII.)

The history of a case of extrauterine pregnancy is characteristic and significant. As the ovum continues to grow, usually within the Fallopian tube, the patient complains of intermittent pain upon one side of the pelvis. This pain is cramp-like in character, and may become severe. At irregular intervals it is followed by the discharge from the uterus of shreds of membrane, sometimes accompanied by blood and mucus. If this membrane be subjected to microscopic examination, decidual cells will be found, less large and perfectly developed than in cases of intrauterine or normal pregnancy. (Plate XIV.)

As the growth of the ovum proceeds, there comes a time when the tissues surrounding the ovum can no longer contain it, and when rupture of this envelope occurs. This is accompanied by sudden and severe pain, with shock and often with hemorrhage from the uterus. The pulse is rapid and feeble, and surgical shock severe in degree rapidly develops.

FIG. 192.



Uterus and sac of broad ligament gestation. (ZWEIFEL.)

If the ovum has escaped between the folds of the broad ligament, the anterior and posterior layers of the ligament and the peritoneum above form barriers to the flow of blood. The blood clots and hæmatoma develops. Active hemorrhage will gradually cease and the patient will gradually recover from shock. If, however, the rupture has occurred upward and into the general peritoneal cavity, no barrier exists to check the flow of blood, and the patient will become rapidly and fatally anæmic and die in collapse.

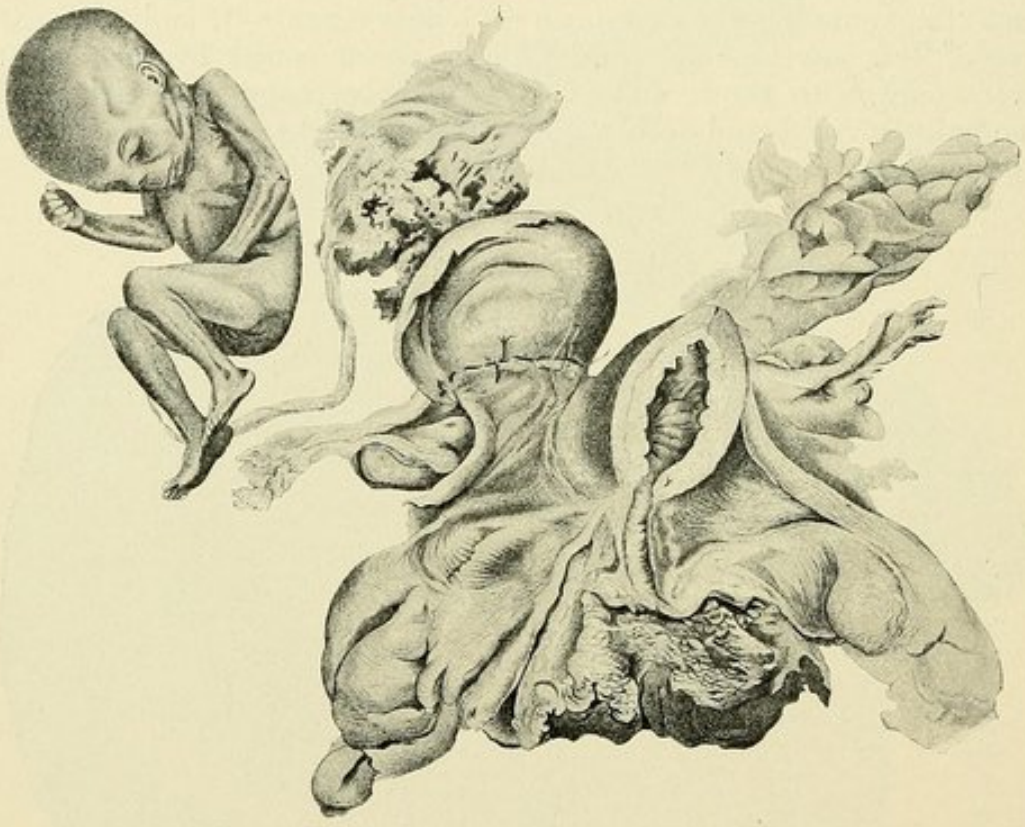
If rupture occurs in such a manner that the ovum escapes beneath

the intestine, peritonitis will develop, and bleeding be limited by an exudate. Hemorrhage may gradually cease and the ovum continue to develop in this abnormal position.

An ectopic ovum can only develop to term when it becomes so implanted that it finds suitable space and nourishment for its continued growth.

The conditions are not favorable in the pelvic cavity, nor is such growth possible in the wall of the uterus, in what is known as interstitial pregnancy. It is only when the ovum develops within the abdomen that the fœtus can go to term.

FIG. 193.



Uterus, fœtus, and sac, ectopic pregnancy. (WYDER.)

As extrauterine pregnancy progresses, the signs and symptoms of this condition undergo corresponding changes. As the ovum grows, the pelvic tumor may ascend at one side of the pelvic brim, being perceptible by palpation, while fœtal heart-sounds may be heard by auscultation.

As the fœtus lies closely beneath the abdominal wall in many cases, heart-sounds and fœtal movements may often be perceived more plainly than in normal cases. If the fœtus dies from lack of nourishment, it becomes a foreign body within the mother, and may be expelled by ulceration. Where the fœtus has been in the pelvic cavity it may be extruded through the rectum, vagina, or bladder. Where the fœtus has perished in the abdominal cavity it may be expelled through the wall of the abdomen, usually near the umbilicus. If the fœtus comes to term and interference is not practised, it will die through the atrophy

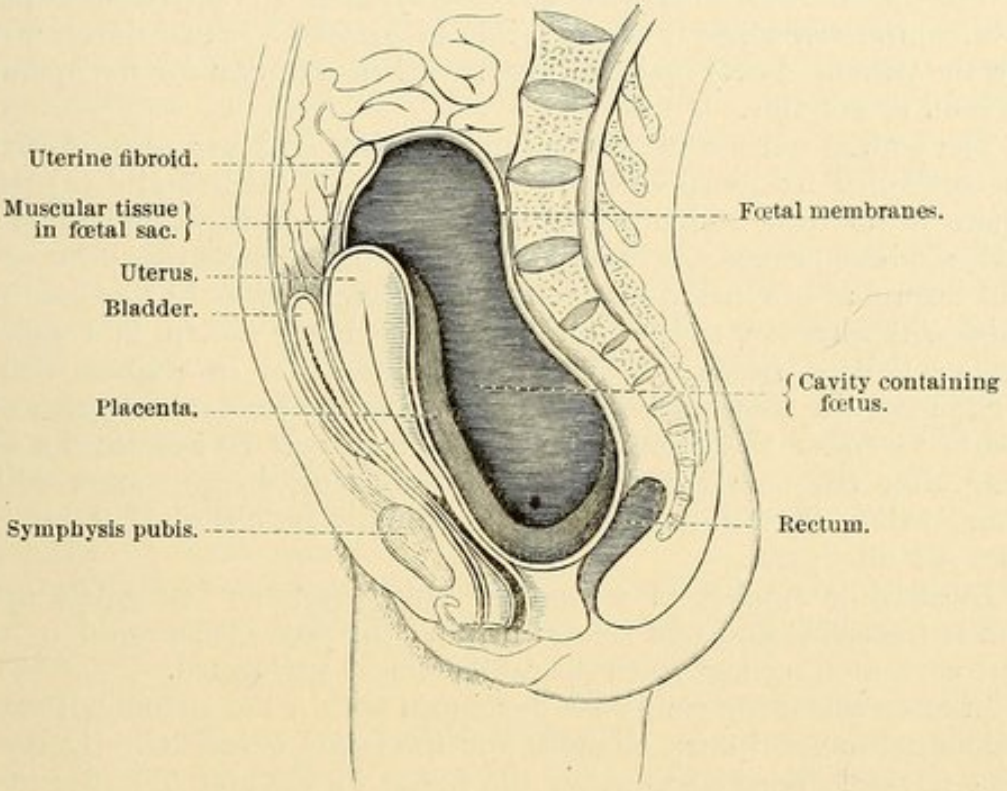
of the placenta, and may be retained within her body until the patient's death.

The tissues of the fœtus may be changed by the deposit of earthy material, forming a lithopædion.

In other cases the fœtal tissues become shrivelled and a condition resembling parchment, known as mummification, exists. In other cases the fœtal parts become enlarged and changed to a fatty substance known as adipocere.

Should the embryo perish and bacteria gain access to its sac suppuration will occur, followed by septic absorption and ulceration.

FIG. 194.



Abdominal gestation-sac. (SUTUGIN.)

The mortality-rate for mothers from extrauterine pregnancy who are not subjected to operation is a very high one. Hemorrhage, shock, and septic infection destroy many of these cases. The mortality-rate for the fœtus shows but few exceptions to a fatal issue. A few cases are on record in which a fœtus at term has been delivered by abdominal incision and has survived.

The treatment of extrauterine pregnancy is purely surgical. Other methods, consisting in the use of electricity, aspiration, or injection of the sac, are unworthy of confidence. If the physician sees his patient before rupture of the sac of the ovum has occurred, he may select a favorable time as soon as possible, and remove the ovum and Fallopian tube in which it is located.

In cases where the ovum is small and is found within the pelvic

cavity the operator has his choice of two avenues for approaching and removing it.

The abdomen may be opened, and the Fallopian tube ligated and removed, with ovum and ovary upon that side; or the vagina may be opened behind the uterus and the ovum, tube, and ovary pulled down, ligated, and removed. The choice of a method of operating will depend upon the size and location of the tumor, and the physician's previous training and experience.

In the presence of rupture of an extrauterine pregnancy the safest treatment consists in abdominal incision, ligation of the bleeding tube, and its removal with ovary and ovum. It is true, however, that cases sometimes recover by the spontaneous and gradual cessation of bleeding. If the operation is refused by the patient, or if the physician is placed in circumstances where it is impossible to operate, he must delay, watching the patient closely and making needed preparation for the operation as soon as possible.

The patient must be kept absolutely at rest, and her pain, if severe, be controlled by morphine and atropine by hypodermatic injections. There is no drug which will control bleeding in these cases, and the patient's best chance lies in absolute quiet, in the hope that a large clot will form and gradually check the hemorrhage. Should this occur, the pulse will improve, the patient's strength slowly return, and she will make a tedious recovery. The effusion of blood in contact with the peritoneum, in these cases, sets up an adhesive peritonitis which often assists to check the bleeding. If such a patient be examined a short time after the hemorrhage has ceased, a large, doughy mass will be found within the pelvis. This will gradually be absorbed if infection does not take place.

In cases of rupture of an extrauterine pregnancy immediate operation is the safest and best treatment, and the physician should be content with nothing less when operation can be performed.

In cases where the embryo is developed within the abdominal cavity, abdominal incision must be made and the fœtus extracted. Delay has been advised by some to allow the fœtus to die and the placenta to become partially separated, thereby greatly diminishing the risk of bleeding at the time of operation. This, however, is not judicious treatment, as it sacrifices the life of the child and does not avoid considerable risk to the mother. In these cases the pregnancy should be allowed to continue to term; the abdomen is then to be opened over the centre of the tumor.

In cases of abdominal pregnancy several dangers are to be encountered which are not present in ruptured tubal gestation. If the pregnancy has proceeded to the point where the fœtus is of considerable size, the placenta has developed, being firmly attached to the intestine, mesentery, omentum, or wall of the pelvis. The effort to separate the placenta is attended with great risk of fatal hemorrhage. In exceptional cases the placenta may be so attached that the tissues to which it is adherent may be ligated, and thus the placenta removed while hemorrhage is controlled. Such would be the case if its attachment was to the omentum, or mesentery, or to the broad ligament, in such

a manner that the tissues of the ligament could be ligated and the whole removed. In most cases, however, it would be necessary for the physician to open the sac at its most dependent and protruding point. When this has been done the fœtus should be at once extracted and the umbilical cord ligated and cut. The fœtal sac should be emptied of amniotic liquid by sponging, and the fluid should not be allowed, if it can be avoided, to enter the peritoneal cavity. A careful examination should then be made to determine the attachment of the placenta, and whether or not it can be safely removed. If there is doubt upon this point, the cord should be ligated again close to the placenta and cut above the ligature, the membranes should be stitched to the edges of the abdominal incision, and the placenta allowed to remain, while the amniotic sac is tamponed with antiseptic gauze, the end of which emerges at the abdominal incision. In this way pressure prevents serious hemorrhage, the placenta becomes gradually loosened, sometimes piecemeal and sometimes almost entire, while an abdominal sinus is left which will gradually close. If the peritoneal cavity does not become infected, the patient's chance for recovery after this procedure is far from desperate.

In cases where the fœtus is dead or partially decomposed no effort should be made to remove the placenta completely, but only those portions should be taken away which separate spontaneously at the time of operation. The gauze tampon should be employed in these cases, and placenta and membranes allowed to come away gradually with the formation of the fistula. When the fistula is established, irrigation may be practised with the mildest antiseptic fluid, care being taken not to disturb granulating surfaces which would further fresh absorption of septic matter.

In cases where the fœtus has developed from the pelvis between the layers of the broad ligament, it may be possible, by making a lateral incision, to enter the sac of the fœtus externally and without opening the peritoneum. The fœtus must be rapidly extracted, the cord tied in two places, and cut between the ligatures. If the placenta separates readily, it may be quickly removed. In the great majority of cases, however, it will be found adherent and should be allowed to remain. The cord should be ligated again close to the placenta and cut beyond the ligature. The fœtal membranes, if uninjured, should be brought to the edge of the abdominal incision and stitched to the abdominal walls. The fœtal sac must be thoroughly tamponed with iodoform-gauze and the gauze allowed to project from the abdominal wound. The placenta will gradually separate and may be removed by the operator, or it will undergo necrosis without infection or suppuration, and will be gradually discharged through the abdominal wound. The patient's recovery will be slow, and an abdominal sinus and fistula will persist for some time.

The children born from extrauterine pregnancy are seldom of good size or of great vitality. They require especial care and tax the resources of the artificial rearing of children severely.

In the present state of our knowledge on this subject we are in the possession of a mass of experience by which methods of treatment must

be judged. The endeavor to destroy the fœtus by electricity or by injection has seemed rational and feasible, and has attracted much attention. The results, however, are not sufficiently good to warrant confidence in these procedures.

In cases of abdominal pregnancy the operator should remove the fœtus and appendages entire if possible. The effort, however, to separate the placenta from the abdominal viscera has been disastrous, as fatal hemorrhage usually occurs in these cases.

Where the relationship of the fœtal sac can be traced to the Fallopian tube upon one side, hemorrhage from the sac may be lessened by ligating the ovarian artery of that side. Although the operation seems incomplete when the placenta is allowed to remain, this expedient has greatly reduced the mortality of abdominal pregnancy and must be accepted as a reliable method.

In no condition has modern obstetric surgery gained better results than in extrauterine pregnancy. If early diagnosis be made and the operation be undertaken promptly under thorough antisepsis, the results are usually favorable.

Intrauterine pregnancy and extrauterine gestation may be present at the same time and in the same patient. The ectopic embryo should be removed by operation and the intrauterine embryo be allowed to develop to term if possible.

CHAPTER III.

THE PUERPERAL STATE AND ITS COMPLICATIONS.

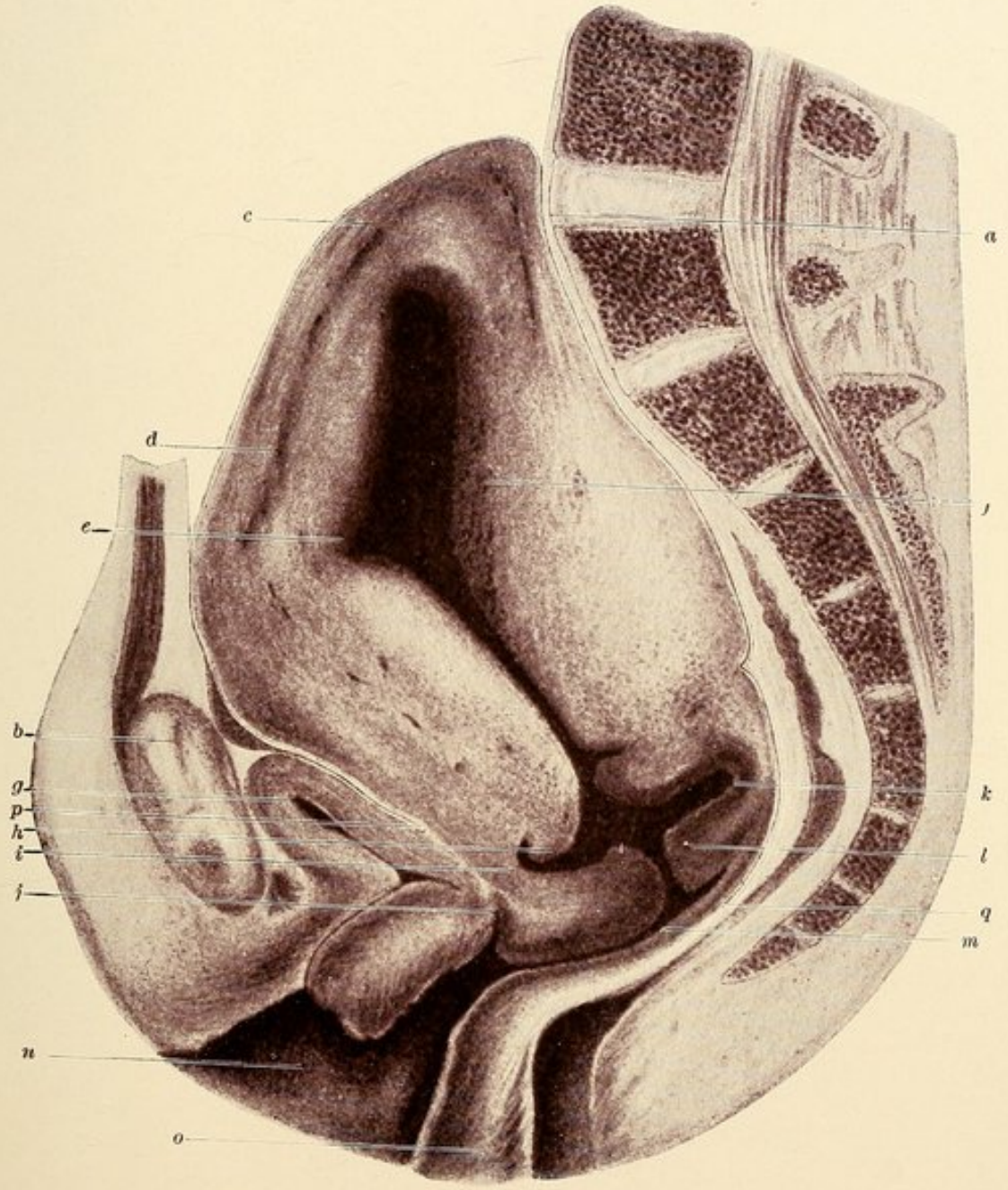
THE puerperal state or lying-in period embraces the recovery of the mother, from the completion of labor to the time when the genital tract has returned very nearly to its former condition and the patient is able to assume the care of her child and her usual occupation.

The duration of the puerperal state depends upon the absence of septic infection, the presence or absence of lactation, the character of the patient's labor, and her general vigor. It is impossible to state a definite limit to this period.

The process by which the genital organs recover from the hypertrophied condition of pregnancy is termed involution. It is characterized by the breaking down and absorption of muscular fibres, by the discharge through the vagina of the disintegrated cells of the decidual membranes, and by the return of the birth-canal and abdominal muscles to the firm and elastic condition which was present before pregnancy occurred. The discharge which occurs from the vagina during this period is termed the lochia. (Plate XV.)

In cases treated antiseptically this discharge consists of blood, decidual cells, and serum. No pus is present, nor are pathogenic germs found in this discharge in these cases. If, however, antiseptic

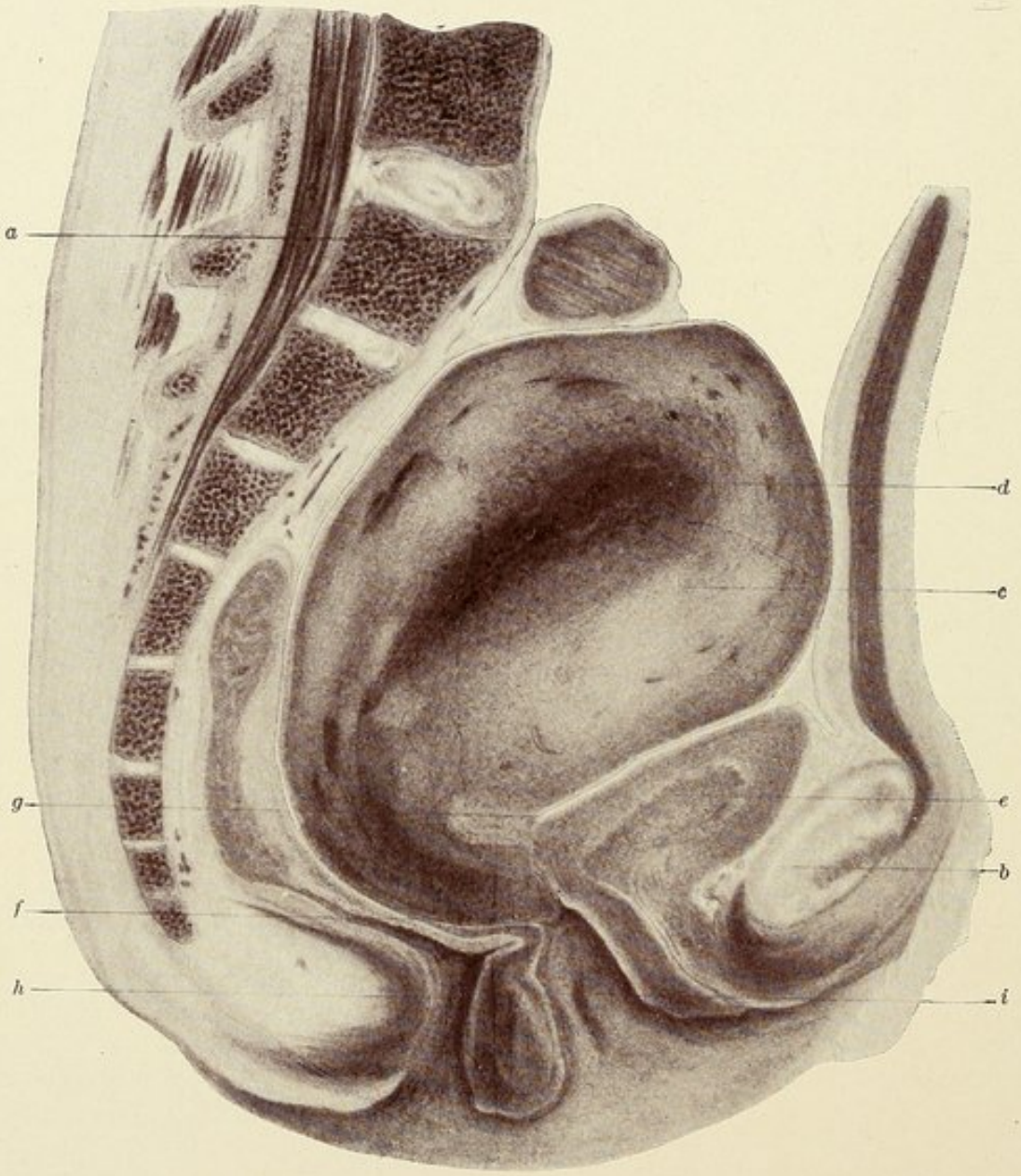
PLATE XV.



Uterus, five minutes after delivery. Vertical Section. (WEBSTER.)

a. Promontory.
b. Symphysis pubis.
c. Fundus uteri.
d. Closed sinus in uterine wall.
e. Uterine cavity containing blood-clot.
f. Placental site.
g. Bladder.
h. Retraction-ring.
i. Lower uterine segment.
j. Anterior fornix.
k. Cavity of uterus above cervix.
l. Cervix.
m. Upper part of vagina.
n. Lower part of vagina.
o. Perineum.
p. Utero-vesical pouch.
q. Pouch of Douglas.

PLATE XVI.



Third Day of Puerperium. Vertical Mesial Section. (WEBSTER.)

a. Promontory.
b. Symphysis pubis.
c. Uterus.
d. Cavity of uterus.
e. Bladder.
f. Os externum.
g. Utero-vesical pouch.
h. Rectum.
i. Vagina.

precautions are not observed and strict cleanliness is not followed, pus is present in the lochia and streptococci and other septic germs are found. In aseptic cases the lochial discharge is less in amount than in those which are not treated by antiseptic means. The odor of the lochial discharge is derived from the glands in the vaginal mucous membrane. It is peculiar, and varies in strength in accordance with the physical temperament of the individual. The odor of pus is not present in the lochial discharge of women treated with antiseptic care.

In cases where laceration has occurred and suture has not been practised granulating wounds are left in the genital tract which heal gradually. Pus is often formed upon the surface of these wounds, and germs are found upon these surfaces in abundance. (Plate XVI.)

The puerperal state is also characterized by the establishment of a new function, that of lactation.

As pregnancy advances the acini of the mammary glands develop and become filled with granular cells known as colostrum-corpuscles. These are gradually supplanted by fully formed milk-globules when the secretion has become established. The duration of this process varies in different patients, but the secretion of milk is usually established in from three to five days after the birth of the child.

The function of lactation has an important influence upon the patient's recovery, aside from the supply of milk for the child. The stimulus which the development of the breasts and the child's nursing occasion aids considerably in the contraction of the uterus. In a healthy mother the patient's general nutrition is promoted by a successful establishment of lactation, and although the patient may lose weight while nursing her child, still her general condition will be improved. Conception occurs but rarely in nursing-mothers, and hence a new tax upon the mother's strength is avoided. Some assert that repair of a sutured perineum and pelvic floor goes on less successfully in women who are nursing than in those who do not. There can be no question, however, that the general involution of the genital tract is promoted by lactation.

The pulse, temperature, and respiration of a healthy puerperal woman differ but little from those in ordinary health. The pulse-rate decreases immediately after labor, but rarely falls below 65. The temperature may range from 99° to 100° F., but in healthy patients does not exceed this limit. The respiratory rate is virtually that of a healthy woman who lies in bed. The secretions become fully established as soon as labor ceases. While during labor it is not uncommon for a patient to secrete but little urine, the amount increases gradually after delivery, as does also the percentage of solid matter contained in the urine. The bowels rarely move spontaneously with sufficient freedom to remove the fæces which accumulated during pregnancy. When, however, the intestine has been thoroughly unloaded, in healthy women the digestive organs act with regularity and vigor.

Many puerperal patients perspire freely until after the secretion of milk is well established. The nervous system of the puerperal woman is commonly extremely sensitive to disturbances of an emotional

nature. Fright, grief, or anger creates profound disturbances, often accompanied by sudden fever. In healthy patients, however, the puerperal period is commonly a time of contentment and happiness. The appetite of the lying-in woman is rarely good until after the emptying of the intestine and the establishment of the secretion of milk. When, however, the flow of milk is abundant and is well taken by the child, the patient commonly enjoys food and takes it with avidity. The return of general strength and vigor varies greatly in different individuals.

No definite time can be fixed at which all patients should leave their beds and assume their former occupations. As a rule, however, a full month is needed after childbirth before the mother is able to assume her ordinary duties and superintend the care of her child. In perfectly healthy patients the first efforts to sit up or to stand are followed by no disagreeable sensations beyond those of ordinary weakness. In nervous women and in frail and delicate women the complaint of backache will often be made and demands the attention of the physician. (Plate XVII.)

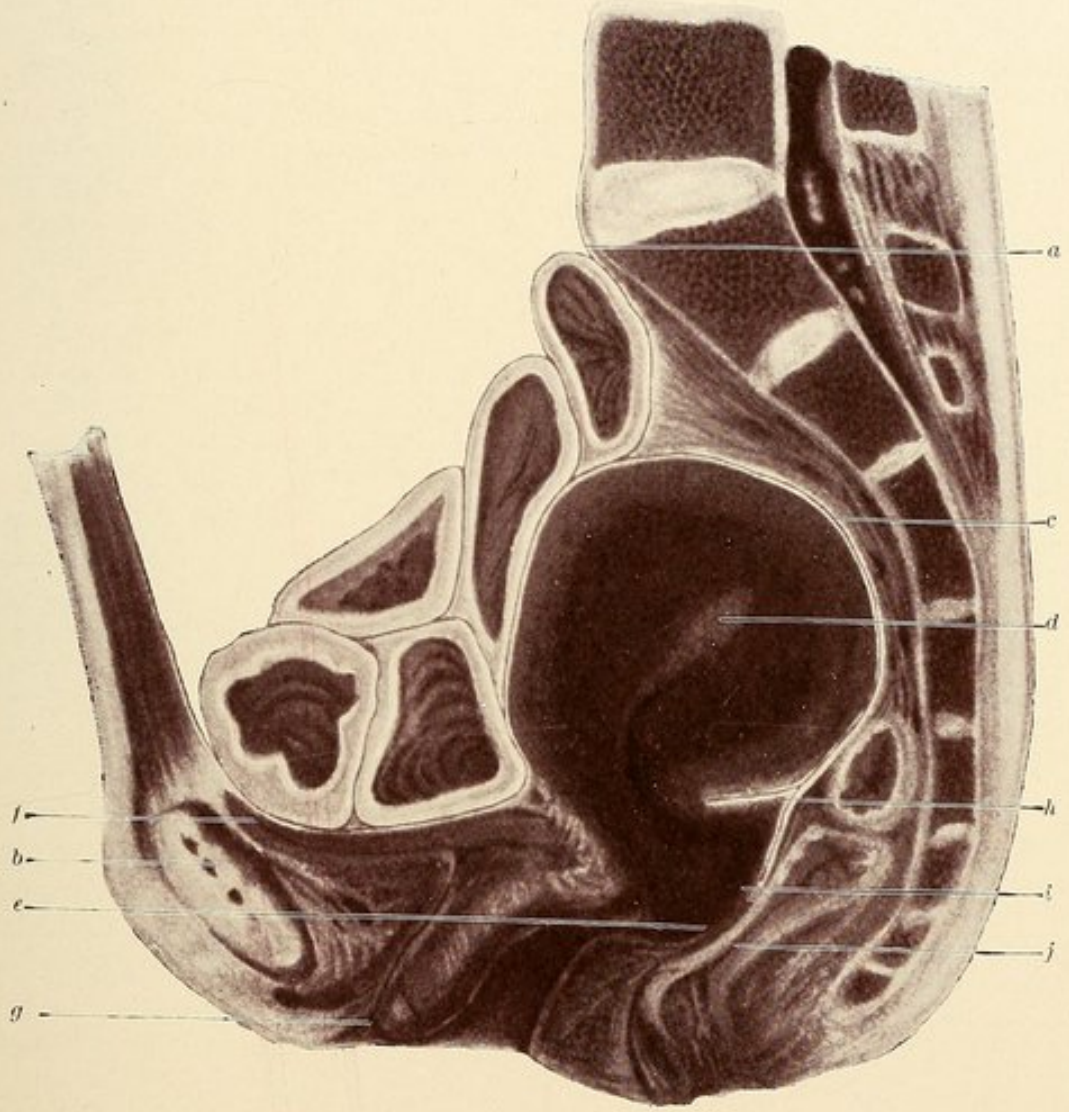
If the pelvic floor and vagina are in good condition and the uterus is small and in proper position, backache must be looked upon as a neuralgic pain, demanding rest and improvement in nutrition. Where, however, an anatomical cause for this distress is present, the removal of that cause will be followed by recovery.

The general health and recovery of a puerperal patient will depend in a very large degree upon the intelligence displayed in her care by her attendants and by the patient herself. Perfect cleanliness, absolute quiet, and regularity are of the greatest importance. If the patient and her friends are not sufficiently intelligent to understand this, her nurse must secure these advantages for her patient if possible.

In addition to direct cleanliness in everything which pertains to the patient, antiseptic precautions are imperative. In healthy women douches after labor are unnecessary. In cases where no sutures have been taken the external parts should be thoroughly cleansed with bichloride of mercury solution, 1 : 4000, after each micturition and defecation. Sponges should never be used for this purpose, but absorbent cotton, cheesecloth, or clean old linen is permissible. The nurse should thoroughly cleanse her hands before douching the patient, and having placed beneath her a receptacle for the fluid and having thoroughly cleansed her hands with soap and water and bichloride solution, 1 : 2000, the nurse should separate the labia with the thumb and finger of one hand, while the other grasps a handful of cotton or linen soaked in bichloride solution, and holding it above the parts squeezes out the fluid which runs over the labia. In this way the parts can be showered with the antiseptic solution and the discharge washed off without inserting the finger or disturbing the tissues. If small lacerations exist, they should be freely powdered with boric acid, or in hospital practice with iodoform.

A clean dressing over the vulva is of great importance and should not be difficult to obtain. One of the best and cheapest materials for this purpose is the cheapest quality of cheesecloth. This may be boiled

PLATE XVII.



Fifteenth Day of Puerperium. Vertical Mesial Section. (WEBSTER.)

a. Promontory.
b. Symphysis pubis.
c. Fundus uteri.
d. Cavity of uterus.
e. Os externum.
f. Bladder.
g. Urethral orifice.
h. Bit of right utero-sacral ligament.
i. Posterior fornix.
j. Rectum.

in water containing sodium bicarbonate, thoroughly rinsed, and soaked in bichloride of mercury solution, 1 : 2000. It may be wrung out and dried, and used in convenient folds as an absorbent dressing. If moderate expense is not an object, bichloride gauze may be cut into suitable strips which are folded double ; between the layers borated cotton may be laid, forming a soft, thoroughly clean dressing. In hospital practice oakum and jute may be evenly carded and made into pads covered with cheesecloth. If no material but clean linen is available, this may be torn into convenient strips, wrung out of bichloride solution, 1 : 2000, and used as a dressing. Cheap cotton-batting soaked in bichloride is often useful, placed between the folds of old linen or cheesecloth.

All soiled dressings during the puerperal state must be burned. The practice of washing out or rinsing napkins and again using them is dangerous and dirty in the extreme. If a soiled napkin be rolled tightly in a piece of paper, it can be burned in an ordinary range or stove. The patient's body and linen should be absolutely clean. A rubber sheet is necessary over the mattress, and above this a draw-sheet, which should be frequently renewed.

The care of the breasts requires also the direct use of antiseptic precautions after labor. The breasts should be thoroughly washed after labor in soap and water and in plain water, and then in bichloride solution, 1 : 4000. Before and after nursing the nipples and the child's mouth should be thoroughly cleansed with saturated solution of boric acid. The best of clean surgeon's lint or clean, old, soft handkerchiefs should be saturated in boric acid, wrung out, and laid upon the nipples. The breast-binder with shoulder-pieces should be applied as soon as the breasts begin to fill, and is useful in keeping the dressings in place. The abdominal binder, while not necessary in strong women, gives comfort to the average patient by keeping the abdominal muscles quiet.

The breast-binder is made of unbleached muslin which has been washed so that it is pliable, and should be wide enough to cover entirely the distended breast, and long enough to pass about the patient over the breasts and to button or pin comfortably in the median line of the body. It should be hemmed, and, if desired, buttons and buttonholes should be added at the point of meeting. If it is desired that the bandage should fit smoothly, a V-shaped piece must be taken out at the lower border in the axillary space or the bandage should be fitted to lace at these points. Two shoulder-straps of double thickness, of unbleached muslin, three or four inches wide, should be sewed to the upper edge of the bandage at the part which will come upon the patient's back at her shoulders. These should be brought over the shoulders, crossing in front or behind, preferably the latter, and should be left free to be pinned to the anterior and upper edge of the binder. By varying the point at which these are attached in front the nurse can alter the direction of tension on the bandage, thus raising and carrying the breasts toward the centre-line as the varying size and distention of these organs indicate. Some have cut holes in the bandage over the nipples the size of a quarter of a dollar and have hemmed the edges of these apertures, thus allowing the nipple to protrude and the child to nurse without unfastening the bandage. Unless the edges of

these holes are hemmed, the weight of the breast will cause the nipple to protrude more and more through the apertures and will gradually split asunder the bandage, tearing the cloth and causing a prolapse of the breast. The nipple should not be left uncovered to come in contact with the clothing, but should be protected, as indicated, with clean, soft linen, soaked in boric-acid solution. Others prefer not to have the holes for nipples in the bandage, but to unfasten the bandage at each nursing. If it is necessary to make considerable pressure upon the breast, a thin layer of borated cotton may be placed over the breast and the bandage applied over that. The breast-bandage is not only a suitable protection and means of maintaining antisepsis, but it is a great comfort to the nursing-woman, and very efficient in preventing engorgement of the breasts and the discomfort which this condition causes. The routine use of this bandage and dressing for a considerable time, in the experience of the writer in hospital and private practice, has greatly diminished the number of cases in which the patient experiences suffering from the breasts, and has made the occurrence of mammary infection, even in hospital cases, very rare.

The abdominal binder should be wide enough to extend from the pubes to the umbilicus and long enough to encircle completely the patient's body. It should be made of unbleached muslin which has been washed, two thicknesses being required unless the cloth is unusually heavy, and it may be equipped with buttons and buttonholes and with lacings, or may be fastened by pins, gathered at the sides to fit the patient's figure. It should be applied as soon after labor as the physician is sure that uterine relaxation and hemorrhage will not occur. It should be pinned from above downward, care being taken to bring the uterus into the median line and downward to the brim of the pelvis before compressing the womb with the bandage. It should be pinned smoothly and sufficiently tight to keep the patient's abdominal walls reasonably quiet. Where the uterus is unusually large a compress of antiseptic gauze of sufficient size to cover the womb and sufficiently thick to increase the pressure at that point may be laid upon the uterus before the binder is fastened. To the lower edges of the binder in front and behind there is fastened a strip of antiseptic gauze or of clean linen, which serves to maintain the occlusion-dressing over the vulva in position. The patient should have several binders, in order that they may be frequently changed and kept thoroughly clean. The advantages of the use of the binder are that the patient's muscles, which have been stretched to their utmost during labor, are supported during involution; that distention of the abdomen by gas in the intestine is less frequent; that the uterus is kept in better position at the brim of the pelvis; and that a convenient support is given to the appliances for maintaining an occlusion-dressing over the vulva. The disadvantages of the abdominal binder are that, in a patient who has not a competent nurse, it may obscure the condition of the uterus and prevent the detection of a hemorrhage; that if improperly fastened from below upward, it may carry the uterus out of the pelvis and further relaxation and hemorrhage; and that it may, through failure of cleanliness, become an added source of risk from its contaminating

presence. These objections, however, are more than outweighed by the advantages which the binder possesses when used in competent hands.

The emptying of the intestines after labor should be taken in hand on the second day. It is well to give a suitable pill at evening and follow it the next morning by a copious rectal injection of soapsuds, one quart; castor oil, two ounces; spirit of turpentine, one tablespoonful, beaten with the yolk of a raw egg. For subsequent use it is better to employ this injection each morning.

Among the pills which have been found useful in the puerperal state, Barker's post-partum pill, so-called, often serves a useful purpose. Its formula is as follows:

Compound extract of colocynth	grs. 20.
Extract hyoscyamus	grs. 15.
Powdered socotrine aloes	grs. 10.
Extract nux vomica	grs. 5.
Podophyllin }	
Ipecacuanha }	each gr. 1.

In twelve pills; two to be taken at night.

Where the tongue is furred and coated the compound cathartic pill of the United States Pharmacopœia may be given at night, followed by a saline in the morning. Calomel, grains 1½, with bicarbonate of soda, may be taken in powder or in capsule at night, followed by citrate of magnesia in the morning. Where a tendency to catarrh of the intestine is present the compound rhubarb pill of the Pharmacopœia is useful. Where the milk comes in with great freedom and the breasts are much distended the free use of salines for two or three days is especially valuable. Citrate of magnesia may be used, Hunyadi water, Rochelle salt, or Carlsbad salt, as the habit of the patient will permit. The patient's bowels will rarely be emptied efficiently by a single medication, and it will be necessary to give repeated attention to this matter during the lying-in period. After the supply of milk is established and the bowels have been thoroughly moved, the patient will do well to use cascara sagrada, followed by rectal injections of soapsuds at a temperature sufficiently cool to stimulate the bowel. Chronic constipation can be avoided better by the use of cold injections than if hot enemata are taken habitually. Extract of nux vomica may be taken during the lying-in period, either alone or combined with aloes and belladonna, to maintain the contractile power of the intestinal muscle. As the puerperal period advances, fruit may be added to the diet of the patient and other articles of food which will tend to lessen the danger of obstinate constipation. The patient should not lie habitually upon her back, but turn frequently from side to side, and after the first ten days she may leave her bed and use a commode to have the bowels opened, with considerable advantage. As soon as it is possible to employ massage the intestines should be carefully treated in this manner, which will assist greatly in preventing the retention of feces. Intestinal torpor is exceedingly common in the puerperal state, at times annoying, because it interferes with the patient's appetite and prevents the assimilation of food which is so

much needed. In selecting purgative drugs those should be chosen which are least likely to disturb the infant by transmission through the mother's milk. At the same time the mother is rarely constipated without the child sharing in her difficulty, and in such cases sufficient of a laxative drug is usually obtained through the milk to act favorably upon the child. Those drugs which are most apt to affect the infant are the active purgatives, and especially those which produce an irritation of the intestine. Salts pass also into the milk, but often with less irritation of the bowel of the child than do the more drastic drugs.

If the diet be carefully selected and if the patient be given plenty of water, much can be done to avoid constipation without the use of drugs. The action of the skin is to be maintained by a daily sponge-bath. Whenever possible gentle massage may be begun as early as the second week after labor. This may be gradually increased until an hour's time is occupied. Although massage is a luxury and subjects the patient to additional expense, it is the most useful agent in promoting the prompt and complete recovery of the patient.

In using massage in the treatment of puerperal cases it is very important that massage be practised very gradually. At the end of the first week, if the patient has done well, massage may be applied to the limbs and to the back only. In rubbing the legs and thighs, massage should not be applied higher than the middle of the thighs, in order to avoid any danger of injuring the veins in the femoral region. As soon as the patient becomes accustomed to the treatment and it is seen to agree with her, massage may be gradually extended over the body, the abdomen being rubbed over the intestine only. The course of the large intestine will be followed and in this way constipation will be very considerably lessened. The small intestine should also be lightly rubbed, but massage should not be applied over the uterus before the end of the second week. At this time, while the uterus should not be kneaded, light rubbing over the womb not only does no harm, but will act as a stimulus to a proper involution. If the patient requires every precaution to secure proper nourishment, olive oil or cocoa-butter may be used in giving massage, with a positive gain in promoting the patient's recovery. Massage should be preferably taken in the morning, and after the treatment the patient should be kept perfectly quiet for at least an hour in the hope that she may drop asleep.

Massage may be applied to the breasts when they are overdistended, and in the absence of any signs of infection and inflammation. The hands of the masseuse should be carefully washed with soap and water, thoroughly rinsed, and then scrubbed in bichloride solution, 1 : 2000. The surface of the breast should be made clean and sterile. Olive oil should preferably be used as a lubricant to the skin. The massage should be applied to the breasts by gentle stroking motions directed from the periphery toward the nipple. The breast should be gently raised and held as nearly as possible perpendicularly to the surface of the body. Engorgement in the breast caused by overdistention of the milk-ducts can usually be efficiently relieved in this manner. Should, however, this massage be painful to the patient it must be discontinued at once. During the fourth week full massage with muscle-kneading may be

applied to the limbs and back with positive advantage, although the treatment should be limited, for the abdomen, to rubbing only. In the case of nervous and anæmic women there is no method of treatment so successful in promoting involution and recovery from labor. Like all other methods of treatment this must be employed with discretion, when it is most beneficial.

Especial care must be taken to secure for lying-in women an abundance of rest and sleep. The first rest which the mother takes after labor should not be disturbed to nurse the child. When nursing has begun the child should be fed at regular intervals of two hours. Between the hours of ten at night and six in the morning the child should nurse but once. While the room should be dark while the patient sleeps, it is a mistake to keep the mother in a darkened room. Sunshine and light are necessary for proper nutrition. The patient's diet must be nutritious and easily digested. She should be fed at least four times in the twenty-four hours.

It is unwise to confine a puerperal woman to a liquid diet that more milk may be secreted. The most digestible forms of meat, raw fruit, well-cooked vegetables, and cereals may be used to advantage, with milk; plenty of water must be taken, while cocoa and weak breakfast tea may be allowed.

The diet most suitable for patients after labor consists first in broths, soups, milk-toast, milk, junket, and, if desired, a small quantity of freshly made English breakfast tea or one cup of weak coffee daily. The patient should be limited to this diet until the bowels have been thoroughly moved, and the secretion of milk has become well established. When this has occurred, the most digestible solid food in the form of soft eggs, lamb-chops, fish, and birds may be taken once or twice daily. An abundance of cooked fruit or of perfectly ripe raw fruit in season will be found advantageous. Gruels, fine hominy, whole wheat, cracked wheat, or oatmeal may be taken once or twice daily to advantage. Ripe vegetables in season, suitably cooked, furnish a welcome addition to the dietary. No pastry or indigestible articles should be allowed. Tapioca and rice-pudding may be taken once daily with benefit. The patient should take an abundance of water, the effervescing waters furnishing a very agreeable addition to the diet.

Although the needs of a lying-in woman for nourishment are very pronounced, still the mistake must not be made of overtaxing her digestion. If the tongue is furred or coated and a tendency to constipation is present, the diet must be limited until the condition of the digestive tract and the appetite warrant its increase. Patients are sometimes seen who have suffered from obstinate constipation during pregnancy, and in whom the intestine is slow in resuming its normal activity. In these cases milk and cream peptonized by the cold process furnish a useful substitute for meat. In very warm weather the most simple kinds of ice-cream allowed to become soft are most grateful. Women of weak digestion seldom do well on alcoholic stimulants, and these substances are very rarely needed during the puerperal period. Women are occasionally seen, however, in whom a small quantity of wine or beer seems most beneficial in promoting

digestion and strength. The belief exists that tea and coffee have considerable influence in determining the amount of milk secreted. It is very doubtful whether this rests upon any accurate observation, or whether it is more than a domestic tradition which should not be allowed to influence the physician in charge. While the tendency formerly was to underfeed puerperal patients, the digestion and the diet of each woman after labor require careful and individual supervision.

The most important complication of the puerperal state is septic infection. This is produced by poison introduced during or after labor or from the absorption of necrosed material which results from injury during labor. The symptoms of this condition are those of surgical sepsis. In the milder cases infection occurs in some lesion of the vagina. Such are found in tears of the perineum and pelvic floor and also in injuries of the mucous membrane which ordinarily escape detection. Between two and three days after labor the patient is taken with a chill, followed by fever and rapid pulse. The mucous membrane of the vagina is red and swollen, the lochia diminish, pain is experienced in the abdomen and pelvis, while constipation is usually present. In favorable cases septic germs do not extend beyond the vagina. The symptoms subside as the vaginal inflammation grows better in a few days.

If these patients be examined, areas of granulating tissue will be found in the genital canal, covered with a grayish-yellow film. This coating is composed of pus and bacteria.

In favorable cases this covering gradually disappears, and beneath, a granulating tissue forms rapidly and heals firmly.

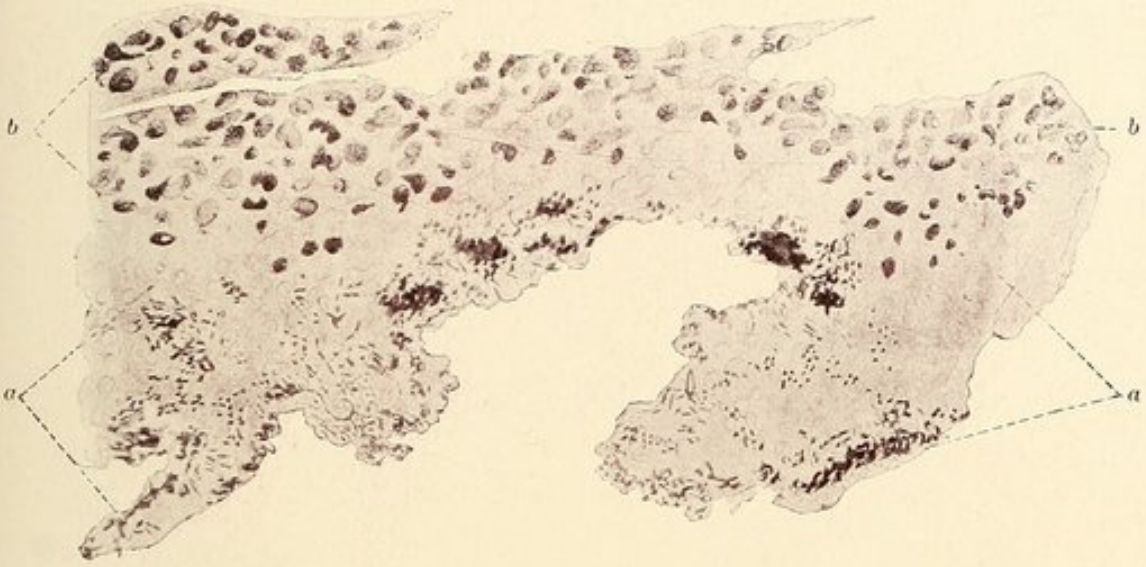
If, however, the poison extends beyond the point of entrance into the vagina, the lymphatics of the deeper tissues become involved, the cellular tissue of the pelvis is infected, while the interior of the uterus also becomes septic. (Plates XVIII., XIX., XX., XXI.) The symptoms showing this extension are higher fever—103°, 104°, and 105°F.; pulse of 120 to 140; lochia containing pus; and an exudate in the pelvis around the uterus. Unless the process be promptly checked the poison spreads rapidly to the peritoneal covering of the uterus. The Fallopian tubes may become involved, while the peritonitis does not remain localized at the uterus, but spreads throughout the entire peritoneal sac.

The thrombi which close the uterine sinuses often become infected, and septic material is carried into the circulation, causing systemic infection. Thrombosis of the veins of the liver may occur, while emboli may be carried into the spleen, the kidneys, and lungs. (Plates XXII., XXIII., XXIV., XXV.) Thrombosis of the cranial veins and embolism of the cerebral arteries may also occur. Unless the patient be of exceptional vigor and be freely supported by food and stimulants, profound septic infection proves fatal. The patient becomes exhausted; cardiac and respiratory centres fail; delirium and coma develop; nutritious food cannot be taken, and the patient dies of exhaustion.

In favorable cases the uterus resists the poison. Peritonitis may become localized and infection be limited.

PLATE XVIII.

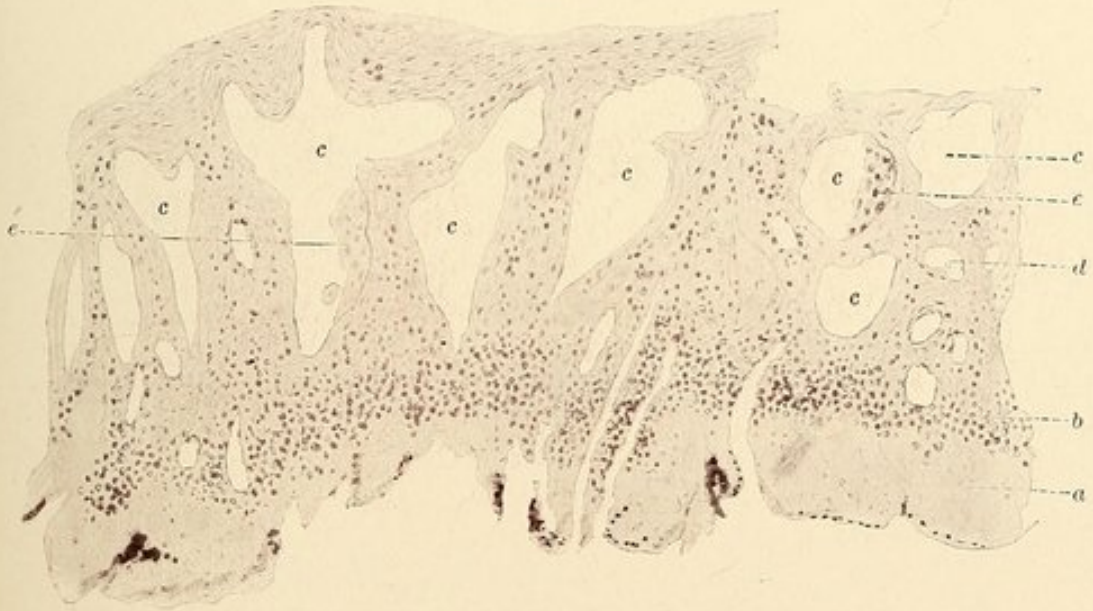
FIG. 1.



Section through Decidua from Putrid Endometritis, removed by Curette on Ninth Day. (BUMM.)

a. Necrotic tissue swarming with bacteria. *b*. Zone of reaction, showing nuclei of leucocytes.

FIG. 2.



Section through Decidua. Septic Endometritis, Curetting on Seventh Day. (BUMM.)

a. Necrotic tissue, bacteria in masses. *b*. Resisting-zone of leucocytes. *c*. Lumen of glands. *d*. Cross-section of bloodvessels. *e*. Remnants of epithelial cells of uterine glands.

FIG. 3.

Streptococci growing between Muscle-fibres. (BUMM.)

PLATE XIX.

FIG. 1.

Section through Decidua and Muscular Wall of Uterus. Fourth Day. Death from Septic Peritonitis. (BUMM.)

a. Necrotic decidua. *b*. Muscular tissue.

FIG. 2.

Puerperal Lymphangitis. (BUMM.)

a. Lymphatics filled with streptococci. *b*. Bacteria penetrating muscle-fibre which is necrotic.

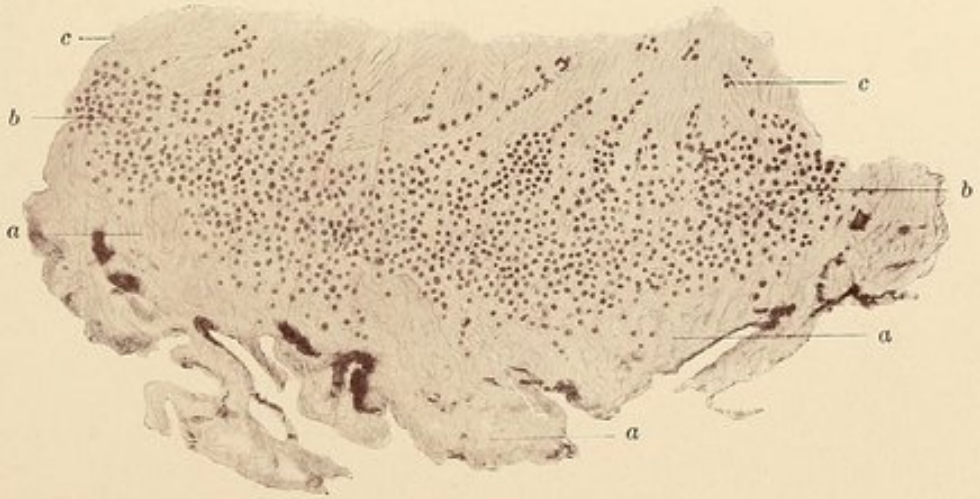
PLATE XX.

FIG. 1.

Section through Uterine Wall. Septic Lymphangitis, Twelfth Day. (BUMM.)

a. Necrotic decidua with streptococci.
b. Lymph-spaces.
c. Reaction-zone.
d. Lymphatics, with streptococci.
e. Upper layer of uterine wall.
f. Peritoneal exudate, with streptococci on uterine wall.

FIG. 2.

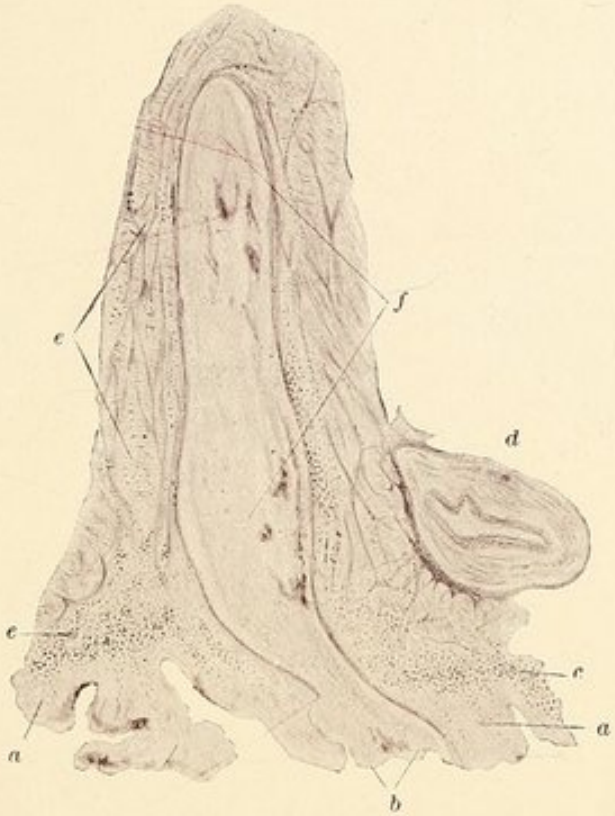


Section through Endometrium in Thrombotic Form of Sepsis. (BUMM.)

a. Necrotic decidua, with colonies of bacteria. *b*. Well-developed zone of reaction. *c*. Muscular tissue.

PLATE XXI.

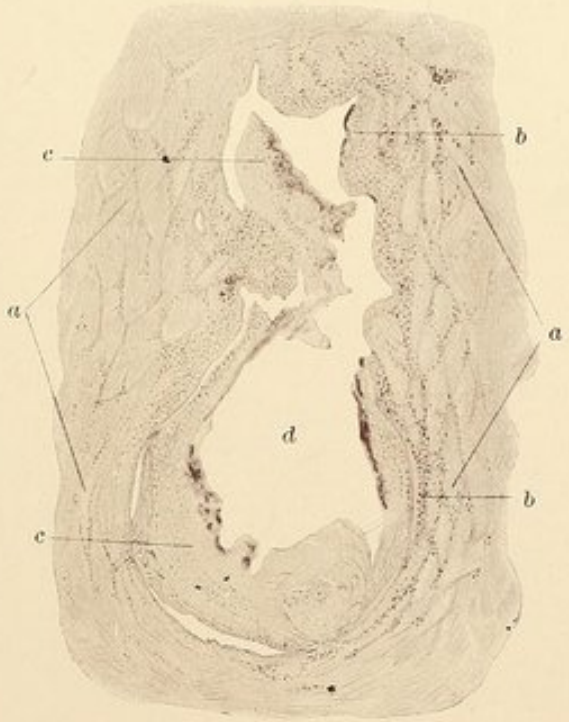
FIG. 1.



Section through Placental Site of Uterus. Death on Eighth Day after Birth from Embolic Septic Pneumonia. (BUMM.)

a. Necrotic decidua with colonies of streptococci and saprophytes.
b. Juncture of a venous thrombosis from placenta, full of bacteria, with inner wall of uterus.
c. Reaction-zone of leucocytes.
d. Section across a utero-placental artery.
e. Uterine muscle.
f. Extension of thrombus (*b*) into deep tissues.

FIG. 2.

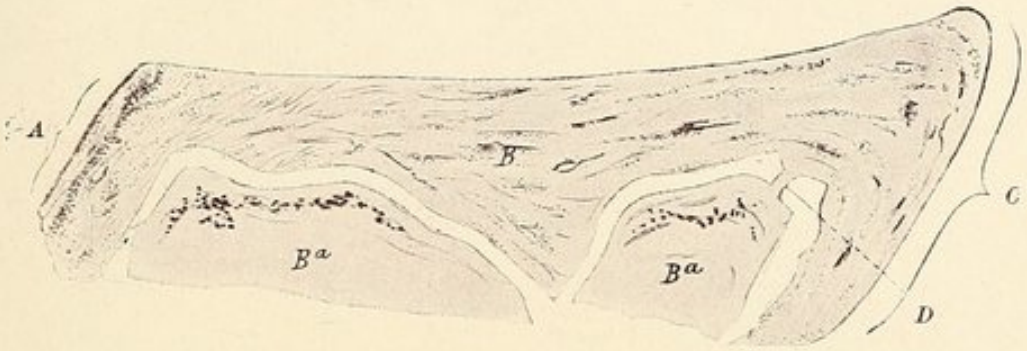


Broken-down Thrombus from Placental Site of Woman who Died of Puerperal Pyæmia. (BUMM.)

a. Uterine muscle. *b*. Vein, its walls infiltrated with necrotic cells. *c*. Thrombi filled with streptococci.

PLATE XXII.

FIG. 1.



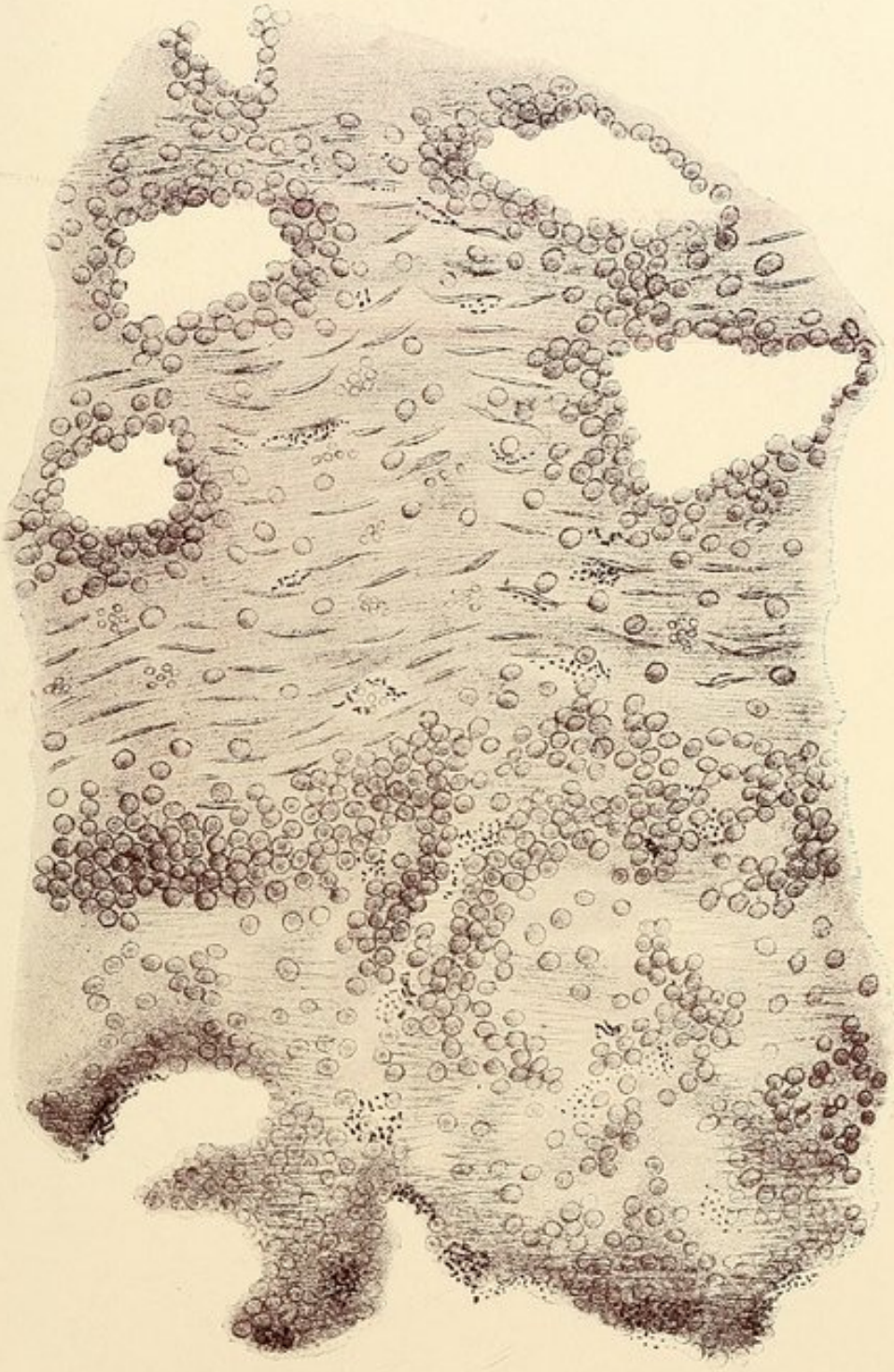
Pyæmia in Fibroid Uterus. (GAERTNER.)

A. Endometrium.
B. Fibro-myoma.
C. Serous covering of uterus.
Ba. Necrotic masses with bacteria.
D. Connective tissue.

FIG. 2.

The same, showing Veins and Lymphatics crowded with Bacteria.

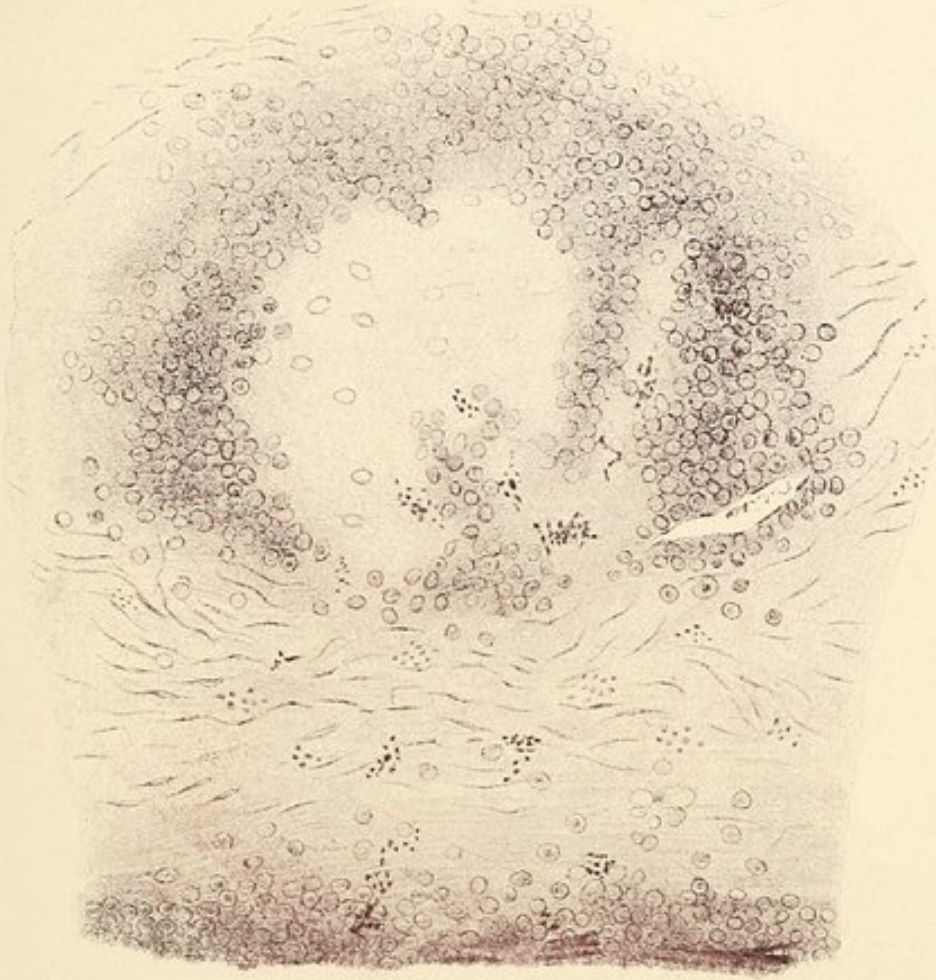
PLATE XXIII.



Diphtheritic Sepsis, showing Tissue crowded with Bacteria, and Cells forming Diphtheritic Exudate. (GAERTNER.)

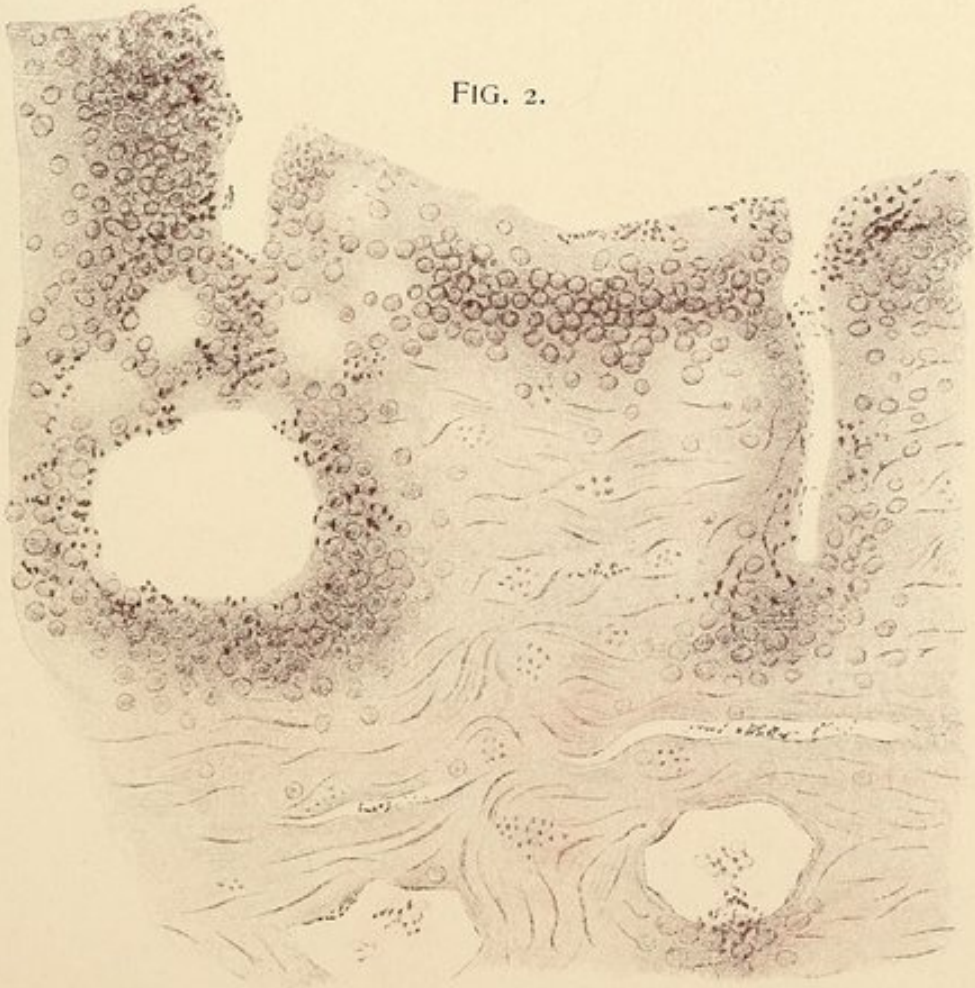
PLATE XXIV.

FIG. 1.



Diphtheritic Sepsis. Mass of Exudate in Endometrium. (GAERTNER.)

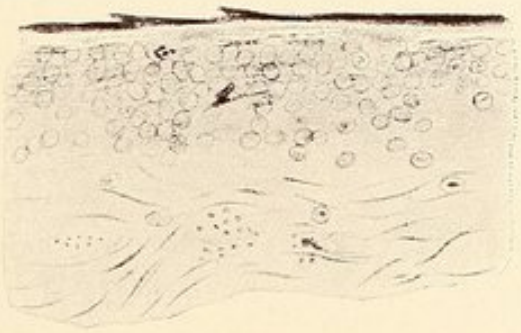
FIG. 2.



Sepsis after Abortion, showing Bacteria and Necrotic Cells around Lumen of Glands. (GAERTNER.)

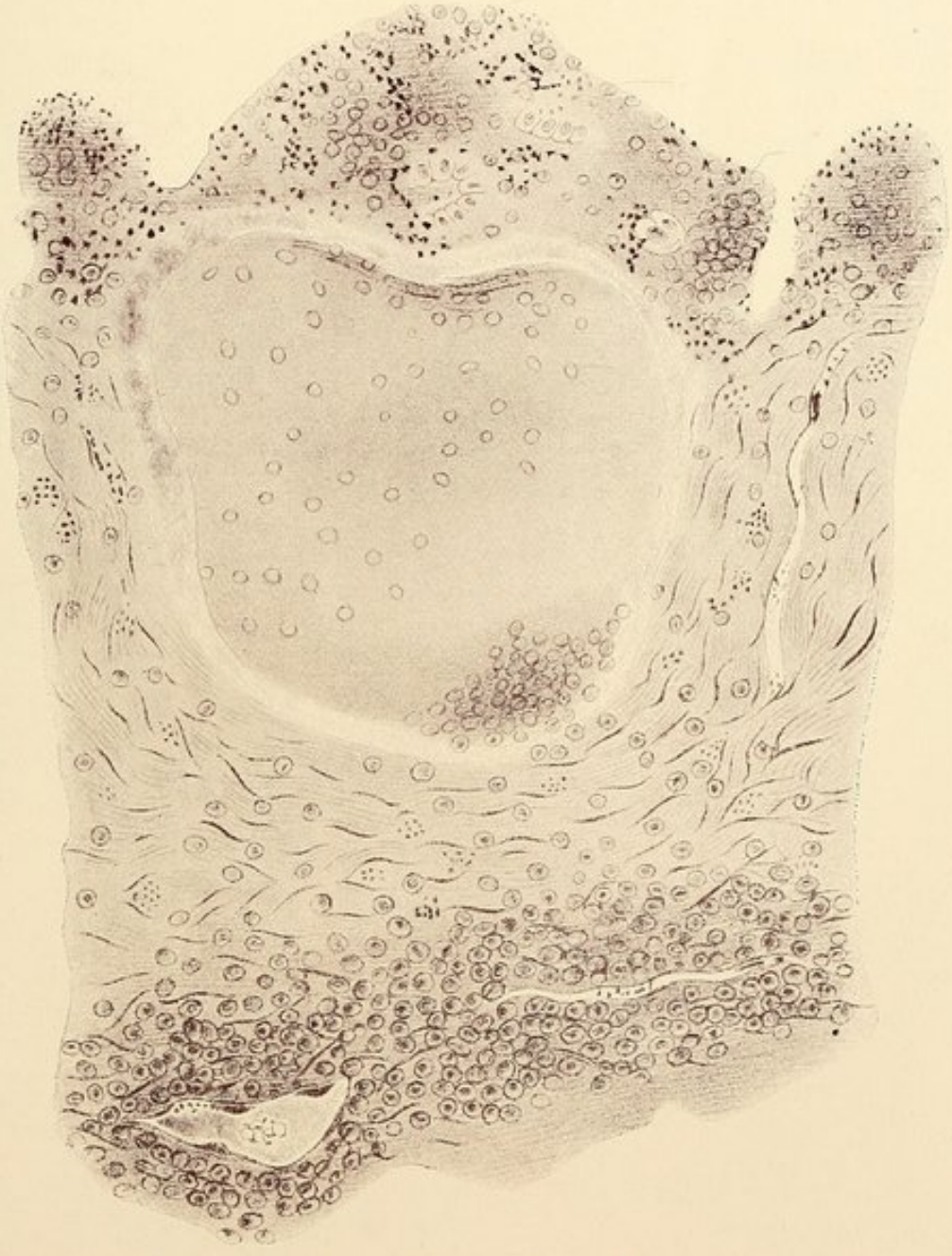
PLATE XXV.

FIG. 1.



Diphtheritic Sepsis. Bacteria invading Muscle of Uterus. (GAERTNER.)

FIG. 2.



Abortion for Vomiting. Necrotic Placenta, Septic Infection, Death. (GAERTNER.)

Multiple abscesses about the joints or in the connective tissue may develop, and, if drainage is secured, the septic foci may gradually heal.

Adhesions in the pelvic peritoneum bind down the pelvic organs, and exudates will mat together the intestines and abdominal peritoneum; recovery is prolonged and tedious and the patient's general health will remain permanently impaired. Lactation will fail, and the child may become infected through the hands of the nurse or by taking infected milk from the mother. In cases which persist for some time the development of septic foci may cause errors in diagnosis, the patient dying by septic pneumonia, not recognized as caused by puerperal sepsis.

In cases in which the septic poison enters the circulation directly through the uterine sinuses, the course of the disease is more rapid. Patients develop high temperature with profound intoxication, apathy, profuse sweating, and rapidly sink into septic coma.

The treatment of puerperal septic infection is most successful in prophylaxis. When septic vaginitis occurs the vagina should be thoroughly douched with soap and water, followed by water only and then bichloride of mercury solution, 1:4000. The vagina should be examined to discover any lacerated surfaces. These should be touched with bichloride solution, 1 : 500, or tincture of iodine, followed by carbolic acid and alcohol, equal parts; they should then be dusted thoroughly with iodoform. If a laceration has occurred and stitches have been inserted, it will usually be found that healing is not going on. The stitches should be immediately removed and the parts allowed to separate to be thoroughly disinfected. The patient should be given a saline purgative—a teaspoonful of saturated solution of magnesium sulphate in a small quantity of hot or cold water every hour until the bowels move. A turpentine stupe should be placed over the abdomen. Improvement is usual in these cases in twenty-four to forty-eight hours after this treatment is begun. Vaginal douches, 1 : 4000 bichloride, may be repeated four times in twenty-four hours.

If, however, the lochia become foul and fever rises with the pulse, the septic poison has entered the uterus. No time should be lost in thoroughly disinfecting the genital tract as far as is possible. With antiseptic precautions and under ether, if necessary, the vagina should be cleansed and douched with an antiseptic, and the uterus thoroughly curetted and irrigated with carbolic acid, 2 per cent., or creolin. The blunt obstetric curette is preferable in these cases, to avoid opening the uterine sinuses which have been closed by thrombi. Following the curette the uterus should be tamponed lightly with iodoform-gauze. In addition to local treatment the patient should be given strychnine, $\frac{1}{60}$ of a grain, every six hours, and whiskey or brandy with liquid food every three hours. Fever must be reduced by sponging, bathing, or packing. Pain in the abdomen may be controlled by an ice-bag or iced turpentine stupe over the uterus.

If no improvement occurs in twenty-four hours, the question of opening the abdomen or of opening the vagina to drain the pelvic cavity must be seriously considered. In cases in which an exudate can be plainly distinguished the pelvic cavity may be entered by opening the

posterior vaginal wall. Adhesions must be broken up with the finger, and an iodoform-gauze drain or drainage-tube may be inserted. If a tumor can be detected in one of the Fallopian tubes, it may be removed through the vagina, or if the parts are so adherent that it cannot be brought down, abdominal section is indicated, with the removal of septic tissues from above.

It is best to secure drainage whenever practicable through the vagina, and in severe cases the abdomen may be opened, the diseased uterus removed, and a gauze drain carried down through the vagina, the abdominal incision being closed without suprapubic drainage.

Cases of septic infection are sometimes observed in which the infective focus localizes itself in the peritoneal cavity, and by the formation of an exudate walls off its contents from the general peritoneal sac. In neglected cases such a collection of matter finds exit by the process of ulceration, perforating the abdominal wall or burrowing in the rectum or bladder. Wherever such a collection can be discovered it should be emptied and drained, the prognosis being favorable for recovery. If it can be detected by vaginal examination, the vagina should be opened. After incising the most dependent part of the pelvic abscess it should be very gently washed out with normal saline solution, and the opening kept from closing by the use of a tampon of iodoform-gauze. Care must be taken in washing out the cavity that its wall is not perforated, and that no violence is done to the surrounding tissue. The prognosis in such cases is good. The patient, if her strength be sustained, may recover rapidly from a condition of great prostration.

When the abscess is in the abdomen its most protruding point should be carefully located, a simple incision made, and the pus evacuated with as little disturbance as possible. The opening must be kept from closing by a gauze tampon and the parts be kept thoroughly clean. Should infection not occur through some leak through exudate which had been poured out by the focus of infection, the chances for recovery also in these cases are good. The patient's recovery is necessarily a tedious one. Adhesions very commonly form in these cases between the intestinal and the parietal peritoneum and between the uterus and the peritoneum. Should the patient subsequently become pregnant, she may experience considerable inconvenience during the early months of pregnancy. Usually, however, no further operation is requisite in these cases, as adhesions to the uterus gradually become distended and permit the womb to rise out of the pelvis as pregnancy advances.

The constitutional treatment of puerperal septic infection is quite as important as operative procedure. As soon as infection manifests itself the peritoneal cavity should be promptly drained by salines, a teaspoonful of a saturated solution of magnesium sulphate being taken every hour until the bowels move freely. The complaint of pain in the abdomen will often be relieved by the use of turpentine stupes. Where fever is high and developed suddenly an ice-bag laid upon the abdomen is often of value.

The reduction of temperature in septic patients is a matter of great importance, not because fever is in itself fatal, but because fever interferes

with the patient's nutrition and reduces her strength. No greater error can be made than to give puerperal septic cases antipyretics. They serve to diminish the patient's strength and power of assimilation, while they obscure the diagnostic features of the case. When the temperature is sufficiently high to annoy and depress the patient she should be relieved by sponging and bathing or packing with cold or hot water, to which is added alcohol or dilute ammonia. In cases of peritonitis a useful pack for the abdomen is made by using a half-dozen towels, laying them upon ice until they are thoroughly cold, wringing them out, and placing them across the patient's body from the pubes to the level of the heart. If they be changed as soon as they become warm, beginning with the one first placed upon the body, a very efficient pack is thus secured. Patients are occasionally seen who cannot bear cold, but whose fever is relieved by sponging with very hot water. As soon as the patient's fever has yielded to this treatment she should be given liquid food and stimulants, the amount being limited only by her capacity to assimilate. The best food for these purposes is freshly made chicken- and mutton-broth, beef-juice, raw eggs beaten with brandy or whiskey, and peptonized milk.

In selecting stimulants, those should be chosen which contain a considerable amount of alcohol. Such a patient may take to advantage from one to three quarts of heavy red wine in twenty-four hours, and from a pint to a quart of brandy or whiskey. The tolerance which these patients show to alcohol can scarcely be appreciated by those who have not pushed stimulants in treating this disease. Nourishment and stimulants should be given every three or four hours during the twenty-four. Stimulants are to be continued until the patient's temperature has been normal for several days or until she becomes intoxicated. Should the latter occur, a cup of freshly made black coffee and sponging the face with cold water will relieve any disagreeable symptoms.

Diarrhœa is often an annoying feature of these cases. It seems to be a compensatory effort upon the part of nature, and unless it becomes severe it need not be interfered with. Caution should be taken that diarrhœa resulting from mercurial poisoning from the use of bichloride solution does not pass unrecognized. Where bichloride solutions have been used to wash out the uterus, or where frequent vaginal douches have been given to patients debilitated by bleeding, mercurial poisoning readily occurs. We know of no case in which this complication has arisen from the use of bichloride upon the external parts or from the employment of bichloride dressings.

Mercurial diarrhœa soon becomes dysenteric in character, the stools containing blood and mucus and giving great pain. Septic diarrhœa is often painless, the stools containing fecal matter or being serous in character.

In septic diarrhœa salicylate of bismuth may be given in large doses, 30 grains after each bowel-movement, with good results.

Septic patients are often restless and sleep with difficulty. It is best to avoid, if possible, the use of narcotics in these cases. If alcohol and food are pushed, and if the patient has good nursing, she will usually secure sufficient sleep in twenty-four hours without the use of opium.

Where, however, pain must be controlled, codeia, in half-grain doses, or morphine, one-quarter grain, and atropine should be given by hypodermatic injection.

Puerperal septic infection often attacks the urinary tract. If a septic patient be catheterized, infection of the bladder will occur unless the strictest precautions are observed. In cases where gonorrhœa has been present septic germs may remain in the urethra and excite absorption of poison after labor. Septic infection may travel from the bladder along the ureters to the kidneys, and surgical kidney may be added. The diagnosis of septic infection of the urinary tract is made by examining the patient's urine and by observing her symptoms. The examination of the urine will usually show the presence of pus and bacteria, while blood is present in some cases. The patient will complain of pain over the bladder and of a desire for frequent micturition. The urine will be alkaline, and will be passed very frequently and with pain. If the kidneys become involved, the patient will show symptoms of pyæmia, while enlargement of the kidneys may be detected in some cases. Catheterization of the ureters will determine which kidney is involved.

Septic infection of the urinary tract is one of the most dangerous complications of the puerperal state. It is practically impossible to render the entire urinary tract aseptic, while the hypertrophied condition of these organs during pregnancy favors the rapid development of septic germs.

The treatment of septic infection of the urinary tract consists in douching the bladder with creolin, 1 per cent., or saturated solution of boric acid, from four to six times in twenty-four hours If the bladder is excessively irritable, the patient may be anæsthetized and the urethra dilated sufficiently to cause spasms of the sphincter of the bladder to cease, or the bladder may be constantly drained by a catheter. The patient's diet should be milk as far as possible, while the action of the bowels should be kept free.

It is important to ascertain which of the kidneys is infected, and hence the use of the cystoscope with sounding of the ureters is a procedure of value.

In cases where the ureters become infected each should be catheterized to determine whether more than one is the seat of purulent inflammation. It will often be found that the infection has not reached the kidney, but that only the ureters and the pelves of the kidneys have become implicated. In these cases the ureteral catheter should be passed, and, unless drainage is free, a proper tube may be left in the ureter until such is established, and antiseptic injections of boric acid or normal saline solution may be made daily until the condition passes away. While undetected cases of infection of the urinary tract are very fatal because the disease insidiously progresses in its upward course, still the results of treatment are sufficiently good to encourage confidence, and to demand that the effort be allowed, and to lead to further effort in perfecting apparatus and the methods of its use.

The pelvis of the kidney is ordinarily susceptible to treatment through the ureteral catheter. The results of such treatment are generally good.

Should, however, the infection travel from the pelvis of the kidney into the parenchyma of the organ itself, it is not susceptible to treatment, and symptoms of surgical kidney should lead to a radical operation. This may be incision of the kidney with drainage, or more usually the removal of the diseased organ.

Where it can be shown that one kidney is sufficiently septic to threaten the patient's recovery, the kidney may be removed.

The nursing of cases of puerperal sepsis requires thorough knowledge, absolute cleanliness, and great patience and fidelity. If the case be taken with a firm determination to save life, and if the nurse understands how to control fever and how to stimulate and feed, an enormous gain will result for the patient. As lactation commonly fails, the nurse should be competent to prepare milk for the child's use. In severe cases, at least two nurses will be required, and their unremitting care will be necessary to sustain thoroughly and support the patient. Her room should be large and airy, and in winter exposed to sunshine, and should be kept at all times thoroughly ventilated.

In caring for a patient who has had septic infection the nurse will require all possible caution to avoid bedsores and to keep the patient in as comfortable a condition as possible. A comparatively narrow bed, such as the single bed, so-called, is preferable, with a moderately firm mattress which is protected by rubber-sheeting. To avoid bedsores several cushions may be made of sterile cheesecloth filled with absorbent cotton or with borated cotton, which may be placed under various portions of the patient's body which receive the more constant pressure. The patient's skin should be carefully bathed at least once daily. If the patient turns frequently upon her side, these precautions will be rendered much more efficacious in avoiding bedsores. Should the skin break at any point, alcohol and water, equal parts, will be found a very useful application. In addition, powdered oxide of zinc, powdered boric acid, or powdered starch may be employed at any region of the body whenever needed.

Whenever possible an abundance of linen is desired. If this is not available, any clean and soft material may be used. Whatever is used about the patient should not be employed for another until at least it has been thoroughly boiled. When a patient recovers her linen should be treated as if she had suffered with a contagious malady, and should be disinfected accordingly.

Those who attend such a patient run a considerable risk of personal infection in scratches or lacerations upon the hands. If precautions are taken to care properly for the hands, hang-nails and such lesions will be avoided and the danger of infection greatly lessened. Should, however, septic poison enter, prompt surgical treatment is required.

Nurses and physicians occasionally suffer from great irritation caused by the prolonged use of mercurial solutions. Some are affected with eczema, while others experience great annoyance from the prolonged use of creolin.

When such a complication is present the nurse may anoint her fingers with carbolized oil, oxide of zinc ointment combined with lanolin, tar ointment diluted one-half with oxide of zinc or collodion. Sometimes

the change of antiseptic from a mercurial to carbolic acid is efficient in these cases by removing the cause.

Before assuming charge of another case of labor the nurse should thoroughly disinfect herself, as if she had been in attendance upon an acute and contagious malady. The hair should be thoroughly washed, and not only a full bath of soap and water, but also a bath of bichloride, 1 : 8000, or carbolic acid, 1 per cent., may be employed. Fresh clothing entirely should be put on, and all small utensils, and especially nail-brushes, which have been used during the case, should be removed and preferably destroyed. It is better in these cases to use cheap and simple nail-brushes, which are thoroughly efficient. Care should be taken that nozzles of syringes which have been employed about the patient should also be destroyed. Anything which has touched the patient and anything which has been used should, if possible, be dispensed with. The room which the patient has occupied must be thoroughly disinfected and fumigated. The bedstead should be washed with carbolic or bichloride solution, and curtains and hangings should also be disinfected. No nurse should assume charge of a confinement case after caring for a septic patient until at least two or three weeks have elapsed, in order that ample time be given for disinfection.

There can be no question about the great danger of infecting one patient from another, and also of the fact that the breasts become infected when septic lochial discharge is brought into contact with them. It is possible, for example, for the patient herself to apply matter from the vagina to the nipples which will create abscess. In patients whose habits are not cleanly the nurse is often obliged to take unusual precautions to avoid the spread of the infection.

The puerperal patient may suffer from pneumonia or bronchitis in their various forms. The occurrence of pneumonia after labor should at once excite suspicion of septic infection, and the physician must satisfy himself that no such complication exists before he can diagnosticate a simple pneumonia. Exposure to cold in puerperal cases may be followed by broncho-pneumonia which is often severe. The pathology and treatment of this condition in the puerperal woman do not differ from those of the same disease in the non-puerperal.

The prognosis of pneumonia occurring in the puerperal state is at all times grave. If pneumonia be a part of a septic process, it marks transferrence of an infected embolus and emphasizes the severity of the infection. If the pneumonia be a croupous pneumonia, the prognosis is somewhat better, although the condition is one of great gravity. The treatment of pneumonia in the puerperal state is that ordinarily employed in the non-puerperal patient, with the exception of the fact that additional care must be taken to support the patient's strength and especially to maintain the proper action of the heart. Lactation is generally interrupted in these cases, as is necessary for both mother and child.

Jaundice may be seen in puerperal patients, and should not be mistaken for simple catarrhal jaundice, when arising from septic infection. Cases which perish with pronounced jaundice must be considered as septic unless a post-mortem examination can positively prove to the

contrary. Catarrhal jaundice may follow the prolonged constipation of pregnancy, and will usually yield to treatment addressed to this condition.

Pains in and about the joints occur in puerperal women and are often diagnosticated as rheumatism. If the patient has been rheumatic before childbirth, and if she bears the plain signs of rheumatism in her tissues, if septic infection be not present, the case must be considered as one of simple rheumatism. Many of these cases, however, are caused by multiple and minute septic emboli which are carried into the joints from infected foci.

In cases where difficult labor has caused mechanical injury to the veins at the brim of the pelvis, or in cases where such injury occurs during pregnancy, and in patients in whom the blood and the bloodvessels are in an unhealthy condition, thrombosis of these vessels may occur. This complication is especially liable to arise where septic infection is also present. It is not, however, proof-positive of septic infection, as cases are seen where such an added complication cannot be proved.

A directly exciting cause of this accident is pressure or bruising of the veins at the pelvic brim. The predisposing causes are septic infection, prolonged or difficult labor, operative procedures for the delivery of the child, and a diseased condition of the blood or the bloodvessels. The symptoms of this complication are pain in the affected thigh and leg, often coming on suddenly and sometimes so severe as to be described as excruciating. This may follow very shortly after the patient turns in bed or makes an effort to sit up partially. It may follow the application of a tight bandage or dressing about the pelvis. If septic infection complicates this condition, the patient may have a chill and the temperature may rise to 103°, 104°, or 105° F. If septic infection is not present, there will not be a chill and the temperature will not rise above 101° or 102°. The most usual form of thrombosis is that of the femoral vein, which is not septic in nature, and is not accompanied by phlegmon of the surrounding tissues. The less common form of thrombosis of the lower extremity is that which may affect not only the femoral vein, but one or more of the other veins of the thigh, and which is accompanied by cellulitis or phlegmon.

In thrombosis of the femoral vein the leg swells gradually until its diameter is from one-eighth to one-quarter greater than that of the other. The swelling is at first greatest next the body, but may gradually become almost equal over the surface of the affected leg. The color of the part is of a bluish, pearly-white tinge, which gives the impression of a glistening surface. The leg pits very slightly to pressure, is sensitive to the touch, while the affected vein at its point of obstruction can be outlined beneath the skin and fascia. If palpation be cautiously practised over the femoral vein, an area of sometimes several inches can be found giving a cord-like feeling to the fingers, and which the patient asserts is painful to the touch. The swelling increases gradually, the tension varying in proportion to the completeness of the occlusion of the vein and the general vigor of the patient. The skin becomes greatly distended, and the glistening appearance is

more pronounced. Until the seventh or eighth day after the occurrence of this complication there is little, if any, perceptible change in the diameter of the affected leg. The patient's temperature gradually falls from 101° or 102° to 100°, and by the ninth day it can be noticed that the limb has decreased considerably in size. From this time on, should no further complication arise, the leg gradually diminishes until, at the end of two or three weeks, it is but little, if any, larger than the other. The sensation of pain gradually ceases until the patient complains of stiffness and inability to use the leg only. The skin gradually resumes its normal appearance.

Septic thrombosis is not only of the femoral, but also of other veins at the brim of the pelvis. It is accompanied by phlegmonous inflammation of the subcutaneous tissue, which often comes to the point of suppuration, the pus burrowing beneath the fascia and even invading the sheaths of the muscles. Blebs form upon the skin, and their contents may become purulent. This process extends over a considerable area of the thigh, and sloughing may occur, accompanied by the discharge of shreds of connective tissue. Wherever the affected limb presses upon the bed, sloughing is apt to occur, and small bedsores may result. Particles of infected thrombi may be carried to other portions of the body, and a condition of pyæmia gradually results. The patient's fever is considerable at evening, and exhaustion develops and may become fatal.

The treatment of septic thrombosis consists in promptly evacuating all collections of pus. Incision should be made into the thigh as soon as it is evident that suppuration has occurred. These incisions should be douched with antiseptic fluid and the entire limb should be enveloped in an antiseptic dressing. Blebs should be pricked so soon as they form, and the endeavor should be made to prevent, if possible, the formation of pus and the occurrence of sloughing. The patient requires a vigorous constitutional treatment, consisting of the free administration of alcohol, milk, soup, broths, eggs, beef-juice; while, if the stomach permits, quinine, iron, and nux vomica may be given in tonic doses. The burden, however, of continued septic inflammation is frequently so great that the patient finally succumbs.

Cases of thrombosis during pregnancy, while rare, occur sufficiently often to illustrate the fact that mechanical injury without septic infection may bring about this complication. In some puerperal patients thrombosis develops in a very mild degree, not causing a rise of temperature above 101°, with very little pain, the disorder gradually passing away with but trifling inconvenience. Swelling and difficulty in moving the limb may persist for some time and occasion considerable annoyance.

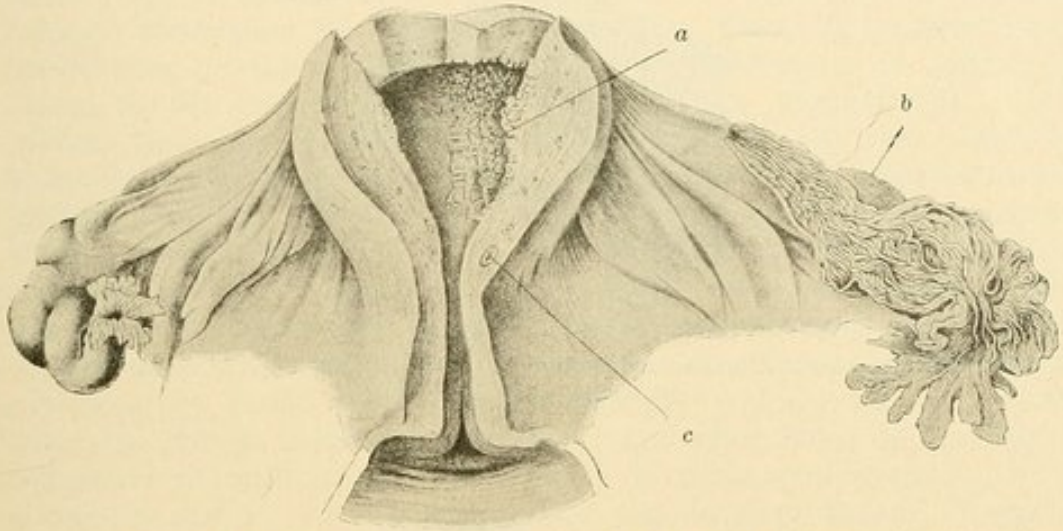
Extensive œdema of the vulva is observed after severe labor in which the tissues have been bruised or subjected to pressure for some time. The surface of the labia may be greatly distended with serum, and the first impulse of the physician may be to puncture the parts and allow the serum to escape. So great, however, is the danger of infection in these cases that it is best not to do so, and to content one's self with careful antiseptic precautions, with attention to the

general condition of the patient, when the swelling and œdema will gradually subside. Should, however, such tissue become infected, abscess must almost certainly result.

The puerperal patient is especially liable to forms of infection other than puerperal sepsis. Tetanus may be conveyed to the lying-in woman, the medium of contagion being sometimes found in non-sterile water which may be used for douches, the antiseptic employed not being sufficiently strong to kill the tetanus-bacillus. To avoid such danger only water which has been boiled should be employed for douches, with the addition of such an antiseptic as seems indicated.

The puerperal patient is especially susceptible to the infection of pneumonia, of tubercle, of cholera, smallpox, influenza; and the exanthematous diseases, as scarlatina and measles, may infect the puerperal patient with serious results. Where another child of the mother has had measles or scarlatina, and the mother is again pregnant, she may,

FIG. 195.



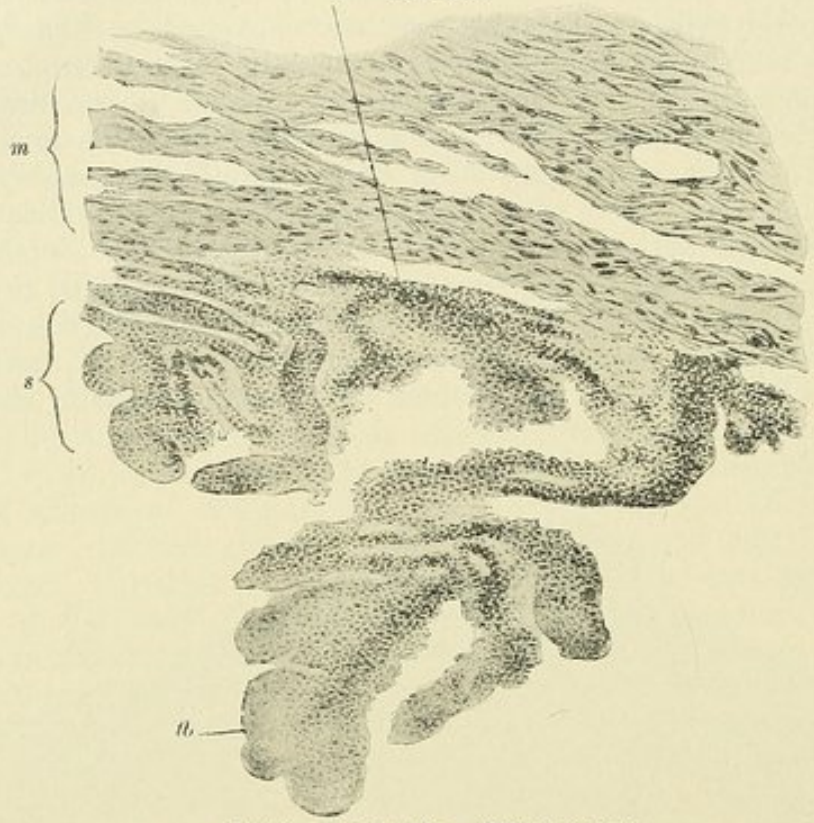
Tubercle of genital tract; abortion at five months; death. (HÜNERMANN.)
a. Placental site. *b*. Left ovary. *c*. Vessel with thrombus and tubercle-bacilli.

through her care of the sick child, acquire an anomalous form of any of the exanthematous diseases. Thus, a mother may have the bronchial symptoms of measles, after caring for a child who has had the characteristic coryza, without the occurrence of eruption to mark the disease. The course of these anomalous forms of the exanthemata is usually mild and need not complicate the mother's recovery after labor.

Pneumonia is especially fatal to patients in this condition, either in the form of croupous pneumonia or a catarrhal variety. The patient's power of resistance seems greatly lessened, the course of the disease is usually extensive and rapid, and the patient's strength is very apt to fail some time before resolution might have been expected. The treatment of pneumonia in the puerperal patient consists in the employment of the same remedies which would be used in those who had not borne children, special care being taken to support the patient's strength by the free use of stimulants.

A new field of treatment in these cases is opened up by the employment of various antitoxins in serum for the infectious disorders. Thus,

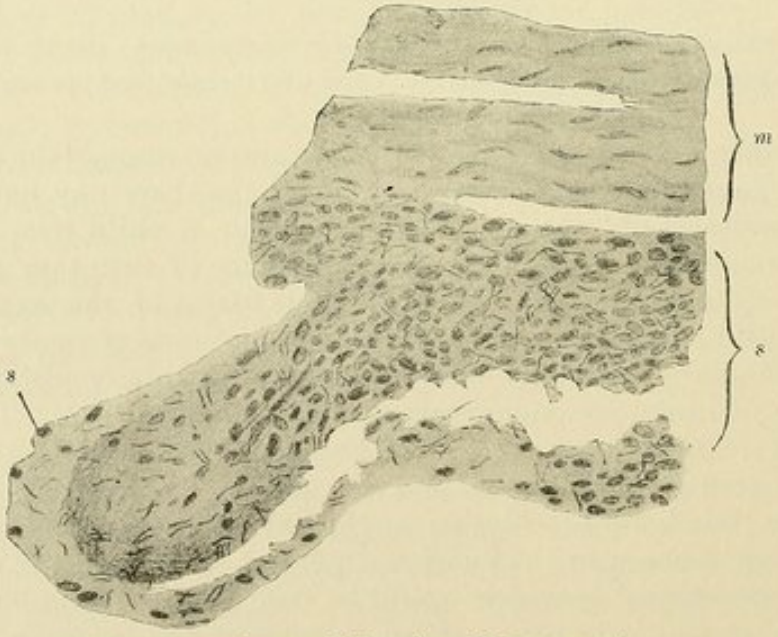
FIG. 196.



Section of left tube. (HÜNERMANN.)

m. Muscular tissue. *s*. Mucous membrane infiltrated with tubercle. *tb*. Tuberculous tissue beginning to break down.

FIG. 197.



Mucous membrane of left tube. (HÜNERMANN.)

m. Muscular tissue. *s*. Mucosa, with tubercle-bacilli.

septic infection may be treated by the toxins of the streptococci obtained by modified cultures from the serum of horses. The appropriate toxins for other maladies may be used in like manner. Should diphtheria develop in the family of a patient in the puerperal condition, it would be quite permissible to endeavor to immunize her by injections of antitoxin. The continuance of lactation in these cases must depend upon the severity of the infection and the temperature of the mother. Anomalous forms with little fever and comparatively little discomfort may not invariably necessitate the taking of the child from the breast. This is especially true if the mother has been exposed during the pregnancy, and it is quite possible that the fœtus has been in like manner exposed before birth.

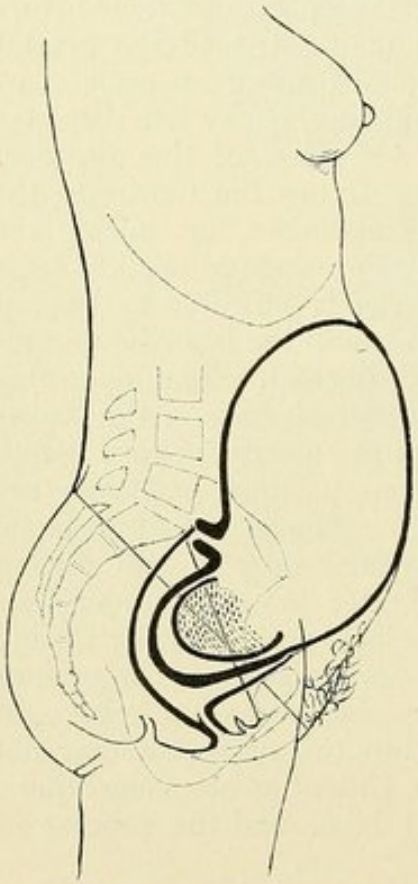
An interesting and important complication has been added to pregnancy and the puerperal state from the effects of operations, done before pregnancy occurred, to remedy disease and malposition of the genital organs. Of these the most common is some form of suspension or fixation of the uterus, to remedy a pre-existing backward displacement. Three operations are practised for the relief of this disorder, namely, shortening of the round ligaments, fixing the uterus to the peritoneum on the anterior surface of the abdomen, or uniting the uterus to the connective tissue in the anterior vaginal wall. It is evident that just in proportion as the uterus is left free to develop normally during pregnancy, in just this degree will the labor be uncomplicated and the puerperal state afterward normal. The operation which interferes least with labor and the puerperal state is the shortening of the round ligaments. This brings the uterus forward before pregnancy in something very like its normal position, and does not necessarily produce adhesions between serous surfaces. As pregnancy advances the round ligaments hypertrophy and stretch, and during labor the uterus is left free to contract and after labor to undergo its customary involution. As the uterus develops symmetrically during pregnancy and in its normal position, the development of its various surfaces is untrammelled, and hence no special distention is brought upon either anterior or posterior wall. While this operation may not be as certain of success in the non-pregnant patient as are some others, still it is least injurious to the conduct of labor and the process of involution.

The second form of operation consists in uniting the serous surface upon the anterior wall of the uterus at the fundus with the peritoneal lining of the anterior wall of the abdomen. With the exception of the adhesions so forming, the uterus is left free to develop during pregnancy and free to contract during the progress of labor. Peritoneal adhesions stretch so readily when recent that the womb is but little impeded as it rises out of the pelvis. During labor the uterus may contract less strongly, and the retraction of the uterus and descent of the fundus may be somewhat interfered with by the results of the operation. The anterior wall of the uterus will not develop as symmetrically as does the posterior, nor will it dilate to accommodate the fœtus, the result being that the fœtus finds more room against the posterior wall. The posterior wall may become dangerously stretched,

the fœtus, forming a sort of sac for itself in the distended portion of the womb.

The third method of correcting backward displacements by operation consists in what is termed vaginal fixation, by uniting the uterus to the connective tissue of the vagina. The effort is made by some to avoid the disadvantages of the previous operations by uniting the anterior wall of the womb with the connective tissue beneath the mucous membrane of the anterior wall of the vagina. The effect during pregnancy and in labor is most disastrous. The cervix and vagina are drawn upward as far as the structure of the tissue will permit, the fœtus develops in the posterior portion of the uterus. Labor is often impossible because the os and cervix are drawn upward, the fœtus presenting at the brim of the pelvis, and forcing downward the anterior wall of the lower uterine segment — an anomalous and difficult position. It has been found so absolutely impossible to deliver the patient through the vagina that cœliohysterotomy has been done for this condition.

FIG. 198.



Pregnancy and beginning labor in a case in which the uterus had been sutured in the anterior vaginal wall. (STRASSMANN.)

The puerperal period in these patients does not differ essentially from that of the others, with the exception of very tardy involution of the uterus. If they have been delivered by operative procedure, their recovery is, of course, complicated by the after-care required for patients delivered by such operative procedure. Especial care must be taken in these cases to see that the uterus is in a position of such a nature that the lochial discharge can readily escape. Especial care is required during the puerperal period to keep the uterus in its proper place in the abdomen, to retain it in its position by an appropriate binder, to keep the bowels from becoming constipated, and to reinforce the patient's strength in every possible way.

One of the most potent causes which can interrupt the normal puerperal state is high temperature, persisting for some time and caused by those agencies which produce fever in women in other conditions. The puerperal patient is especially susceptible and her nervous system is easily disturbed. A very conspicuous example of this is found in malarial poisoning, which often develops at the eighth or ninth day after childbirth, and has a most potent influence, not only in causing fever, but also in preventing the proper contraction of the uterus. The symptoms of this complication are the characteristic chill and fever, with sweating, in the absence of the signs

of puerperal septic infection. The history will usually be elicited of malarial intoxication before or during pregnancy. The examination of the blood should make the diagnosis positive and furnish the appropriate indications for treatment.

This consists in the free use of quinine and arsenic, and also of iron and nux vomica. Quinine may be given to these patients in capsules in accordance with the following formula:

Sulphate of quinine	grs. 60.
Arsenious acid	gr. ½.
Scale pepsin	grs. 20.

In 20 capsules: two to be taken at once, followed by one every six hours.

After the first twenty-four hours this may alternate with iron and nux vomica in the following combination:

Tartrate of iron and potassium	grs. 60.
Extract of nux vomica	grs. 3.
Sulphate of quinine	grs 20.

In 20 capsules: one to be taken three times daily before eating.

Good food and stimulants are also indicated. While the diagnosis may be clear, if the uterus remains large, there would be no harm in gently curetting it with the douche-curette.

Among the most common disorders of the puerperal state is that known as subinvolution of the uterus. In these patients the womb, instead of returning to nearly its former size, remains enlarged, while its supports fail to regain their firmness and contractile power. When the patient attempts to leave her bed and to walk she complains of a sensation of weight and heaviness, with a dragging feeling referred to the back and groins. If such a patient be examined, it will be found that the womb is large and that by reason of its weakened supports it has assumed an abnormal position, usually that of retroversion. A tear of the cervix is often observed in these cases. If such a uterus be subjected to microscopic section and examination, it will be found that the mucous lining is thickened, and that the connective tissue throughout the organ is thickened and heavier than normal, while the muscular tissues show a hypertrophied condition commonly seen during pregnancy. Most of these cases result from septic infection, which prevents the usual return of the uterus, by contraction of its muscles, to its lessened size. This condition is also seen in women who are not septic, but who have gotten up too soon and have too early undertaken their usual avocation. It may sometimes be observed in women who are subjected to great mental strain or privation during the lying-in state.

One of the most important factors in causing subinvolution of the uterus is a lacerated condition of the pelvic floor and a torn and chronically enlarged state of the cervix, with overdistended and infiltrated ligaments, which mechanically prevent the return of the uterus to its normal position, and seriously hinder the retrograde changes in its muscular fibre which constitute normal involution. It is obviously fruitless to treat a patient suffering from subinvolution of the uterus without first ascertaining accurately the condition of the cervix, pelvic floor, and tissues about the uterus, and then correcting any lesion which may

be found in these parts. If this be done, the most important cause of subinvolution is removed. It has been already pointed out in discussing the treatment of labor that lacerations should be promptly closed at the time of delivery. If this course be followed, cases of subinvolution in patients so treated will be found extremely rare. If infection does not occur, an equally important cause for this complication has been removed. It is important that after labor the contractions of the womb which tend to produce a proper return to its smaller size should be watched by the physician from the time that the placenta is expelled. During labor the avoidance of exhaustion and proper relief for the mother in all cases of delayed labor, and such general remedies addressed to maintaining her strength as will prevent exhaustion, will naturally prevent failure of involution. After properly conducted labors this complication will very rarely be observed.

Ergot and strychnine are best administered separately to secure uterine contraction. Ergot should be given in the fluid extract, 15 drops three times daily in water. Strychnine may be given by mouth in doses of $\frac{1}{60}$ of a grain three times daily. Where the element of nervous shock or excessive fatigue is not present ergot alone, without strychnine, may be used for the first two weeks after labor to positive advantage. It is useful not only in promoting uterine contractions, but also by maintaining a tonic condition of the bloodvessels it favors the secretion of milk. In choosing a preparation of iron in the treatment of subinvolution, that must be selected which will be least apt to favor a condition of constipation. Dried sulphate, the tartrate of iron and potassium, or the citrate of iron and manganese, are useful in these cases. In some patients quinine exerts an especially favorable influence, and may be given in capsules with nux vomica as follows :

Sulphate of iron Sulphate of quinine	each	grs. 30.
Extract of nux vomica		grs. 3.

In 20 capsules, one after meals.

A most useful combination in the treatment of subinvolution is found in iron, ergot, and nux vomica. The following formula has been useful :

Sulphate of iron	grs. 40.
Extract of ergot	grs. 4.
Extract of nux vomica	grs. 2.

In 20 capsules: one three or four times daily with food.

In studying cases of subinvolution the physician must not neglect any predominant general condition which may really be the cause of the abnormal state of the uterus. Thus, anæmia may greatly hinder the return of the womb to its normal size. In these cases diagnosis is best made by a microscopic examination of the blood, and treatment should be based upon the results of such examination. In patients with delicate stomachs, pepto-manganate of iron, Fowler's solution, well diluted, peptonized milk and cream, beef-juice, peptonized oysters, and other appropriate forms of food should be employed. The useful effects of minute doses of bichloride of mercury in these cases should not be overlooked. Bitter tonics sometimes exert a very happy influence

and seem to stimulate the muscular fibre of the uterus. Tincture of nux vomica and preparations of gentian are among the best. These may be given in the form of cordial containing nux vomica, or in the following combination :

Compound tincture of gentian Compound tincture of cinchona Compound tincture of cardamom	each	oz. 1½.

Dessertspoonful before meals.

In patients who have suffered from malaria during pregnancy the result is sometimes seen in positive failure of the uterus to undergo involution. No form of treatment is promptly successful in these cases which does not include the administration of quinine among other remedies. In patients who have taken quinine in large doses arsenic may be used instead to advantage. Such patients are commonly troubled with torpid livers, and the caution must be observed to secure a thorough action of this important gland before giving the patient quinine or arsenic in considerable quantity.

Massage is of the greatest value in promoting the general recovery of the patient and restoring her muscular tone. The masseuse should not exclude the abdomen in her manipulation after the second week of the puerperal condition. Hot vaginal douches may be employed for a short time with benefit. Constipation must be avoided, and if the uterus be found retroverted, it should be placed in proper position and maintained there by antiseptic wool or gauze. Where these measures are not successful it is sometimes useful to curette the uterus thoroughly, douching it and packing its interior with gauze. Electricity is valuable in some cases, one pole being placed over the uterus and the other over the lumbar region of the spine.

If subinvolution be recognized during the puerperal period, it is usually amenable to treatment. If it result from undetected septic infection which receives no treatment, an enlargement of the uterus may occur, from which the patient will recover with great difficulty.

The opposite of subinvolution, or excessive involution of the uterus, is sometimes observed. The causes of this abnormality are, first, profound anæmia ; and, second, failure of the mother properly to maintain the tax which lactation imposes upon her. This complication is usually seen in women who nurse a child, and sometimes in those who have an abundant supply of milk. No appreciable symptoms are observed in these cases, except that involution seems to go on even more rapidly than is normal, and no suspicion may be at first excited that anything unusual is occurring. When, however, the patient gets up from her confinement the secretion of milk may gradually fail, and when the child is weaned, or sufficient time has elapsed, menstruation commonly remains persistently absent. Other patients menstruate but slightly and at irregular intervals. Examination in these cases fails to find evidence of inflammation or infiltration of the tissues about the uterus. The womb is considerably smaller than normal and freely movable. Lacerated surfaces seem to have healed, although the cervix has grown much smaller than is usual in these cases through absorption of its

tissues. The patient's general condition is one of impaired vigor, but no symptoms of inflammation or distress call attention to the uterus.

The treatment of this condition is rarely successful, because its development is so insidious and the causes which produce it are rarely within the control of the physician. In women not strong, prolonged lactation should be avoided, and partial feeding of the child should be begun, if not at birth, within two weeks afterward. This is the most important precaution which can be taken to secure the best possible recovery of the mother. In many of these patients the milk seems to agree with the children, while in others infants do much better when partially or wholly supplied with artificial food. Cases are occasionally seen in which the supports of the uterus undergo such atrophy that prolapse of the womb occurs. In these patients operative procedures are not to be undertaken soon after labor, lest the process of involution proceed so rapidly as to impair the healing. When, however, a reasonable length of time has elapsed the uterus should be replaced and retained, if possible, in position by some method of suture.

Patients may complain, after recovery from labor, of the persistence of a discharge from the uterus or vagina. Where this is bright red in color it indicates that involution is not sufficiently far advanced to permit the patient much liberty in the matter of exertion. She should use as little strength as possible and remain in the recumbent posture until the discharge ceases. A dark reddish discharge, sometimes grumous in appearance, is seen in cases of partial subinvolution, and in women of gouty or rheumatic habit. Examination will disclose the uterus somewhat enlarged, although evidences of inflammation are not present. These cases should be treated by attention to the general condition, by the use of iron, ergot, and nux vomica, and are often benefited by hot vaginal douches taken at night. If the general strength of the patient is good, she should experience no discomfort on walking. A moderate amount of walking in the open air will be found beneficial. She should avoid the climbing of stairs, the use of a sewing-machine, or any exertion which causes her to stand in a strained posture and to reach above her head. A tendency to retroversion is seen in many of these cases, and requires the application of a suitable support.

Patients are sometimes annoyed by the persistence of a mucous or muco-purulent discharge from the vagina after labor. A simple mucous discharge usually occurs until the mucous membrane of the vagina has undergone perfect involution. The persistence, however, of a muco-purulent discharge should call attention to the fact that granulating and unhealed surfaces are present in the genital tract. This may be in the cervix or may come from healing portions of the pelvic floor or vagina. This condition is generally cured by appropriate douches. Creolin is one of the best substances for this purpose, and may be used, one teaspoonful to the quart of water, night and morning. If its odor is disagreeable to the patient, carbolic acid, 2 per cent., may be employed instead. Simple hot douches are often useful, while douches of bichloride solution, 1 : 5000 or 1 : 8000, are often of value, alternating with creolin-injections. If treatment of this sort for a

reasonable time does not cure the condition, the parts must be exposed by a speculum, granulating surfaces scraped with a sharp curette, painted with tincture of iodine, 1 part; carbolic acid, 1 part; and glycerin, 2 parts; and douched with antiseptic solutions. The muco-purulent discharge in these cases often comes from enlarged follicles in the glands of the cervix. With these patients the cervix should be exposed by a speculum, thoroughly cleansed with bichloride solution, 1 : 5000, and the follicles pierced by a knife and the diseased surfaces touched with the iodine and carbolic-acid mixture just described. The use of the curette after puncture of the glands is often valuable. This procedure does not require an anæsthetic, but should be done with strict cleanliness, care being taken that no instrument or injection enters the uterine cavity. It is best performed at the house of the patient, in order that she may retain the recumbent posture for several hours afterward.

In cases where vaginal catarrh persists after labor especial attention should be given to the general condition and nutrition of the mother. The drain of lactation or prostration following prolonged and difficult labor will often serve to keep up a catarrhal discharge from the vagina, which otherwise would have disappeared in a short time. When the general health has been attended to suitable injections should be used, and these preferably of weak solutions of carbolic acid or of creolin. These remedies are usually quite sufficient to bring about in a short time the cessation of the discharge.

Hemorrhoids sometimes persist after labor and occasion considerable annoyance. They require the strict avoidance of constipation, the use of cold sponging or bathing to the affected parts, and applications of suitable ointments. If they are persistent and aggravated, the patient should submit to ligation under antiseptic precautions, the operator splitting the hemorrhoid after ligating it, turning out the contained clot, and cauterizing the tissues with carbolic acid. These cases can ordinarily, however, be relieved without operative procedure.

CHAPTER IV.

THE REPAIR OF LACERATIONS OF THE CERVIX CAUSED BY LABOR.

THE obstetrician may not infrequently be called upon to treat a patient suffering from displacement of the uterus and its resulting disability caused by injury to the genital tract in some previous labor. Inasmuch as this condition is directly the result of parturition, it is legitimately in the field of obstetrics, and every obstetrician should be accustomed to operate for these cases. Laceration of the cervix is a frequent result of labor, and was formerly thought to be of great

importance to the woman's after-health. More recent views of pathology have led to the conclusion that it is not a laceration itself, but an accompanying infection with its chronic results, which bring about the condition requiring an operation. In former years much time and attention were given to the problem of the anatomical restoration of the cervix. Emmet's operation for this purpose was widely adopted and extensively practised. There can be no question that this operation anatomically restores the cervix. In some cases, however, it does not have so great an influence in restoring the patient to health as is expected, and this fact leads to the interesting question as to what it is which in cases of torn cervix causes ill-health.

In deciding whether a given case requires the operation of trachelorrhaphy a physician must examine not only the cervix, but the body of the womb, and carefully study the peculiarities of each individual patient. If the uterus be found but little enlarged, if the lips of the cervix are not hypertrophied, if the mucous membrane is not chronically inflamed and covered with patches of granular degeneration, and if the glands in the cervix are not enlarged, the presence of a tear is not a valid indication for closure by operative means. In some of these cases, if the cervix be palpated, a sensitive spot may be found in the torn tissues, which the patient distinctly appreciates upon pressure and which is thought to be caused by an enlargement of a nerve-filament in the tissues. Patients are sometimes benefited by excising this point and closing the tissues by stitches. If, however, no such point be found, with the absence of the conditions just described, there is certainly no good indication for sewing up the cervix. Observation shows that it is possible for a patient to have a cervix very considerably torn and still to be in excellent general health. Her ill-health must, in cases where suffering follows laceration, be due to some other cause than a simple tear of the tissue.

In cases where examination reveals the fact that the uterus is enlarged, that the lips of the cervix are considerably hypertrophied, that the glands are chronically enlarged, and that the mucous membrane has become eroded, there can be no question of the necessity for operative treatment.

This, however, should comprise more than a simple closure of the lips of the cervix by suture. The cavity of the uterus should be thoroughly curetted under careful antiseptic precautions; the uterus should be douched and packed with gauze. The enlarged lips of the cervix, containing degenerated glands, should be amputated and not simply freshened and brought together. When the diseased tissues in the cervix are removed the effect upon the condition of subinvolution is very considerable, and often brings about a relief from this condition.

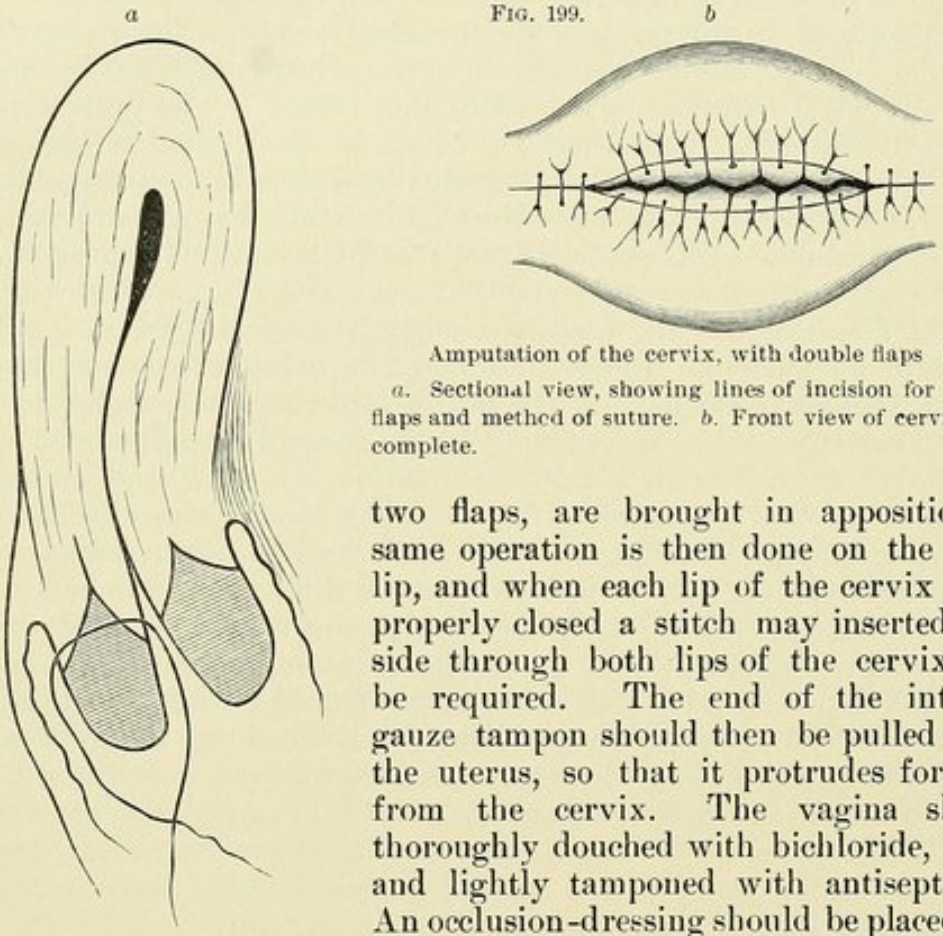
To perform this operation, namely, of amputation of the cervix, the physician will require retractors and specula, using Sims's speculum or those suitable for vaginal hysterectomy. He will also need a small scalpel, tenaculum-forceps, fully curved needles of small and medium size, scissors curved upon the flat, needle-holder, uterine dressing-forceps, uterine dilators, silk or catgut for suture, and a uterine curette, preferably of the sort known as douche-curette. The patient should

be prepared for operation by thoroughly emptying the intestine, by emptying the bladder, and by disinfecting the vagina and the cervical canal. This is best performed by douching the vagina with a mixture consisting of creolin and green soap, equal parts. Of this a 2 per cent. solution is employed. The cervix is to be exposed by a speculum and the cervical canal thoroughly scrubbed with cotton soaked in the solution mentioned, in the grasp of the dressing-forceps. The external parts are to be scrubbed with soap and water, rinsed with hot water, and then scrubbed with bichloride solution, 1 : 2000. The patient is anæsthetized with ether, placed upon her back at the edge of a bed or table, and the field of operation surrounded by sterile linen. In addition to the instruments of the operator there should be at hand antiseptic gauze, bichloride solution, 1 : 2000 ; carbolic solution or creolin, 2 per cent., with stimulants and hypodermatic syringe in good working order. The operator, having cleansed his hands surgically and covered himself with an antiseptic apron or gown, sits before his patient, her hips being brought to the edge of the bed or table, and her thighs supported by assistants or by some form of leg-holder. The vagina should be throughly douched with bichloride solution, 1 : 2000, the cervix exposed by retractors and grasped by the tenaculum-forceps inserted into the posterior lip. Dilatation is then performed by using graduated bougies until a curette can be introduced without difficulty. The curette should then be attached to a fountain-syringe and the interior of the uterus thoroughly scraped, while a carbolic solution, 2 per cent.; creolin, 2 per cent.; normal saline solution, thymol, 1 : 1000, or dilute iodine, should run through the curette, freely flushing the uterus. The fluid will run out from the vagina and should pass over the rubber pad, on which the patient rests, into a bucket beneath the edge of the table. When the fluid returns from the uterus perfectly clear, the womb should be tamponed with a strip of antiseptic gauze three inches wide and a yard long. But a portion of this gauze can be used within the uterus, the rest being employed to tampon the vagina if necessary. The gauze employed within the uterus must be cut so short that its end will not project to any distance through the cervix.

The operator should next proceed to amputate the diseased tissue in the lips of the cervix. The intrauterine tampon of gauze should be pushed up out of the way, and the anterior lip of the cervix seized by tenaculum-forceps. Some prefer to pass a suture through it with which to hold the cervix during the operation. The operator next cuts asunder the lips of the cervix on each side of the incision, extending almost to the junction of the vagina. With a small, sharp scalpel the operator then outlines the incision in the anterior lip of the uterus, running his knife along the edge of the peritoneal covering and along the mucous membrane of the cervix as far internally as the size of the cervix permits. These incisions meet at the sides of the uterus. The operator then incises the lip of the cervix selected, allowing his knife to pass upward and toward the central line, so that the two incisions meet, the part excised having the shape of a wedge, of which the broad surface is external and the narrow internal. In this manner a wedge is excised from the lip and two flaps are left of peritoneal tissue, which

may be brought together with sutures. The material selected for this purpose may be catgut, if any which is positively known to be reliable may be procured, and in default of this medium-sized silk, rendered sterile by boiling, should be used. The first suture is passed in the middle of the cervix. Others are inserted upon either side, and the

FIG. 199.



Amputation of the cervix, with double flaps (SIMON.)

a. Sectional view, showing lines of incision for formation of flaps and method of suture. *b*. Front view of cervix, operation complete.

two flaps, are brought in apposition. The same operation is then done on the posterior lip, and when each lip of the cervix has been properly closed a stitch may inserted on each side through both lips of the cervix, if such be required. The end of the intrauterine gauze tampon should then be pulled out from the uterus, so that it protrudes for an inch from the cervix. The vagina should be thoroughly douched with bichloride, 1 : 2000, and lightly tamponed with antiseptic gauze. An occlusion-dressing should be placed over the vulva, which is kept in position by a T-bandage.

This operation should not occasion severe pain after the patient recovers from the anæsthetic. Irritation about the bladder is sometimes observed, partly owing to the pressure of the tampon and also to the fact that in some cases the traction made upon the uterus during the operation pulls upon the bladder and makes the tissues sensitive. This, however, soon passes off. The patient may lie upon her side as soon as she pleases, and usually requires no anodyne after the operation. If necessary, she should be catheterized every eight hours, and the vulva and meatus should be thoroughly cleansed with bichloride, 1 : 2000, after each micturition and after defecation. Twelve hours after the operation the gauze in the vagina should be removed, the vagina douched with bichloride, 1 : 2000, and again lightly tamponed with antiseptic gauze. In twenty-four to thirty-six hours after the operation the vaginal and uterine gauze should both be taken out and the vagina again douched. The patient should then empty her bladder spontaneously and the bowels should be freely moved. A douche night and morning of bichloride, 1 : 8000, or of normal saline solution, should be given. The patient's diet may be easily digested

food, care being taken that the bowels move daily. If silk has been used for suture-material, it should be removed two weeks after the operation. If catgut is used, it will not require removal. If the patient does well, she will have recovered from the operation in between three and four weeks, and after her next menstrual period has been completed she may go about her usual avocations. The result of this operation is to lessen very greatly the size of the womb, to cure the discharge from the cervix, and thus to stop many of the annoying symptoms from which the patient has suffered.

In cases where obstinate retroversion following labor has complicated a diseased condition of the cervix the operation just described may be supplemented by ventro-fixation of the uterus. This should be done by placing the patient in the Trendelenburg posture, extreme elevation of her body not being necessary. The abdomen is opened in the median line as nearly over the fundus of the uterus as the operator can discover. The body of the womb is then grasped by tenaculum-forceps and brought upward and forward. The anterior surface of the body of the womb is scraped with the scalpel or a blade of a pair of scissors, until the peritoneal covering of the uterus oozes slightly. Two long pieces of silkworm-gut, if possible double, are then threaded into a full-curved Hagedorn needle; the sutures are then passed through the abdominal wall and through the anterior surface of the body of the uterus, at the upper and lower extremities of the portion which has been freshened by scraping. The needle should be passed deeply enough to secure a firm hold in the muscular tissue of the uterus. The suture is brought up through the abdominal wall on the opposite side, its extremities being caught by hæmostatic forceps. The second suture is then passed in a similar way at the other extremity of the freshened surface. While the uterus is held up by tenaculum-forceps inserted into its posterior surface just below the fundus, the two sutures already described are brought together, bringing the abdominal wall in approximation, and turning the uterus upward and forward, so that its peritoneal covering where it was freshened is brought in contact with the peritoneal lining of the anterior wall of the abdomen. These two sutures may then be tied, or, if undue tension and cutting are feared, the stitches are not tied, but are passed through lead plates and then through buckshot which has been perforated for the purpose. When the womb has been brought into apposition the shot are clamped and thus the stitches are prevented from slipping. Additional silk or silkworm-gut stitches are placed in the line of the incision and tied. The wound is plentifully sprinkled with boric acid or boric acid and iodoform, a dressing of bichloride gauze and cotton is applied, and the whole is kept in place by a flannel binder or by strips of adhesive plaster. The vagina is also tamponed with gauze with sufficient firmness to assist in maintaining the uterus in its new position.

The after-treatment of these cases is that usually given to an uncomplicated abdominal section. If pain follows the operation, codeia may be given by hypodermatic injection in doses of one-half a grain. The bowels should be moved on the second day after the operation. The stitches should be allowed to remain for two or three weeks. The

stitches should then be removed, although the tampon in the vagina should be continued, or else a soft-wool pessary should be worn, for four weeks after the operation.

In doing this operation the operator should remember that it is not necessary to bring the womb up tightly against the wall of the abdomen. What is desired is that the scraped surfaces upon the uterus should become adherent to the peritoneal lining of the anterior abdominal wall. This adhesion will stretch somewhat after recovery, but will be in most cases sufficiently firm to alter the position of the uterus very greatly.

In the hands of a good operator the curetting, amputation of the cervix, and ventro-fixation may be performed under one etherization. As hemorrhage is but slight, the patient should suffer no especial shock. Pregnancy in such a patient is rarely attended with serious complication. The uterus will gradually rise into the abdominal cavity, and while there may be slight pain, owing to tension upon the peritoneal adhesions, still this is rarely severe. At labor uterine contractions are usually efficient, and aside from slight irritability of the bladder, which gradually disappears, the after-results of these cases are usually very satisfactory. The attention of the reader is called to the fact that no buried stitches are left by this method of operating, as such might give rise to irritation, and especially in patients who afterward become pregnant. The patient should remain in bed after this double operation for four weeks, and before she gets upon her feet a properly fitted pessary should be applied. She should wear this for two months after the operation. The stitches from the abdominal wound should be removed in two weeks after the operation, and those which hold the uterus may be left until three weeks if they do not cut or produce irritation.

Simple closure of the torn cervix is indicated, as already said, in cases where no especial hypertrophy of the uterus and cervix is present, but where scar-tissue of the cervix is a source of constant irritation to the patient. This operation is sometimes performed for the mental effect only. Nervous and anæmic women, if they know that they have a tear of the cervix, no matter whether it occasions trouble or not, are very apt to ascribe to that lesion pains or pelvic distress often purely neuralgic in character. Tonic and hygienic treatment may fail utterly to improve these cases, and the mind remains convinced that health cannot be secured without an operation. In such a case the patient should not be deceived, but should be informed that the operation may benefit her and may not. It is attended with little risk in good hands, and if she chooses to take the risk there is no objection to its performance.

The preparations for this operation are the same as those for amputation of the cervix. It is well to choose a time immediately after menstruation, although this is not absolutely essential. Curetting is often omitted in these cases, because the operation is usually done where no condition is present which demands the use of the curette. The cervix is exposed, and grasped by tenaculum-forceps and brought within the reach of the operator. The edges of the torn lip of the

uterus are then freshened by a thin-bladed, narrow knife or by sharp scissors. Care must be taken to dissect out scar-tissue in the angle of the tear, leaving perfectly fresh tissue to be united. The freshened lips are then sewn together by silkworm-gut, silk, or catgut, care being taken not to occlude the canal of the cervix. The stitches should not pass through the mucous membrane of the cervix, but down to it. Silk is the most convenient material for suture and gives excellent results.

In freshening the edges of the torn tissue considerable hemorrhage will follow if the cervical artery or a branch be wounded. If a distinctly spouting point can be seen, it may be ligated with fine silk or fine catgut. Such hemorrhage, however, is best controlled by bringing the freshened lips together with a suture. It is very rarely that ligation of a vessel is needed.

The after-treatment of such cases consists in keeping the parts clean by appropriate douches, boric acid or normal saline solution being excellent for this purpose. Stitches should be removed two weeks afterward and the patient allowed to resume her avocation at three weeks after the operation. It is said by those who practise this operation extensively that the risk of tear of the cervix in subsequent labor is not increased by suture. These observers state that patients may be confined at term with good-sized children without a renewal of the old laceration. While formerly this method of treatment enjoyed wide popularity, observation has shown that it is distinctly inferior in value to curetting and amputation of the enlarged cervix. Its field of application is limited, and the class of cases which require this operation is a very small one.

CHAPTER V.

THE REPAIR OF INJURIES TO THE PELVIC FLOOR AND PERINEUM.

One of the most common disabilities following labor is partial prolapse of the uterus, with the inconvenience and suffering caused from tears of the pelvic floor and perineum. The number of women who endure such inconvenience is very large, many of them preferring to go for years in this condition before submitting to an operation. Comparatively few physicians close all lacerations after labor, and many do not even take occasion to make a positive diagnosis of their presence or absence.

It is interesting to know that, if the supports of the uterus be in good condition, a patient may have a very considerable tear of the perineum in the central line without any resulting disability. Cases are

seen in which the perineum has been torn to the rectum, in which the tear did not occur until the outlet of the vagina was reached and in which the supports of the uterus and pelvic fascia were not seriously injured. Many of these cases are seen in strong workingwomen whose muscles are well developed and who suffer no ill results from this condition. On the contrary, in feeble women the slightest injury to the pelvic floor and perineum will be followed by considerable prolapse of the walls of the vagina and even by cystocele and rectocele.

The palliative treatment of torn perineum and pelvic floor is exceedingly unsatisfactory. Where a patient cannot be operated upon the accompanying vaginal catarrh may be somewhat improved by douches, while it is sometimes possible to fit a large ring-pessary or a retroversion pessary in such a way as to assist in supporting the uterus. The condition, however, is most unsatisfactory, and a physician should never consent to his patient remaining in such a state unless operation is positively refused.

To secure a good result from such operations the general condition of the patient must be good. If chronic indigestion and anæmia be present, they must be in a large part removed before operative treatment can be entirely successful. Where chronic vaginitis is present the mucous membrane should be cleansed and made aseptic by douches of tincture of green soap and creolin, one teaspoonful of each to the quart of water, taken once or twice daily. The bowels should be kept open to relieve engorgement of the bloodvessels about the pelvis. When the patient's general condition is proper a time should be chosen as soon after menstruation as possible. If the patient is nursing a child, the child should be weaned or at least partially fed. The preparation of the patient will depend somewhat on whether the tear is complete or incomplete.

The incomplete tear is much the more frequent, and hence will be considered first. In preparing a patient for an operation for its relief the bowels should be thoroughly emptied. On the second evening before the operation a compound cathartic pill or one grain of calomel with soda should be taken at bedtime. On the following morning a bottle of citrate of magnesia or a half-ounce of salts will be required. Unless the bowels move freely, a rectal injection of magnesium sulphate, one ounce; glycerin, one ounce; spirit of turpentine, two teaspoonfuls; and soapsuds, one quart, should be administered. The patient's food should be limited to broth and soup with a little bread and fruit. On the day of operation the patient's rectum should be thoroughly emptied by an injection of castor oil, one ounce, and soapsuds, one quart. The vulva and vagina should be thoroughly scrubbed with soap and water, rinsed, and again cleansed with bichloride solution, 1 : 2000. The patient should be catheterized, anæsthetized with ether, and the field of operation surrounded by sterile linen. The operator will require for this procedure four pairs of light tenaculum-forceps especially adapted to holding flaps of mucous membrane. He will also need a small scalpel, long-handled scissors curved upon the flat, several pairs of hæmostatic forceps, a needle-holder, and curved needles. These may be round or Hagedorn needles. For suture-

material, silk or catgut and silkworm-gut will be needed. A T-bandage and occlusion-dressing of bichloride-gauze should be in readiness. An abundance of solution of bichloride of mercury, 1 : 5000, and a fountain-syringe will be required. A competent assistant is needed to give ether, and a leg-holder must be supplied unless sufficient assistants will be present to hold the legs. A rubber pad suitable for such operations or a piece of rubber sheeting will be required.

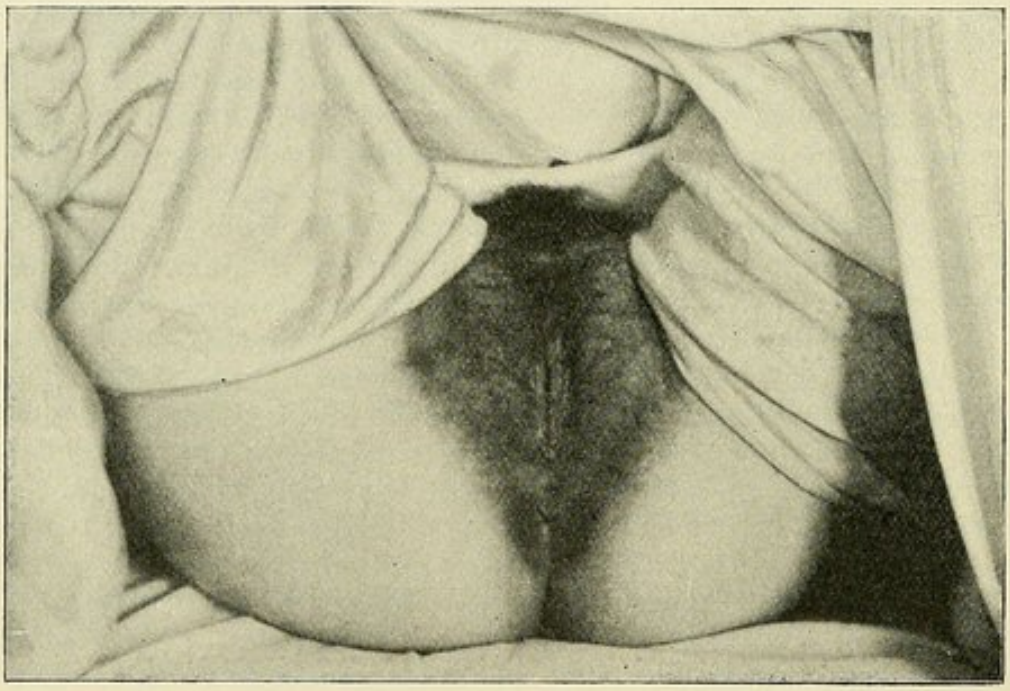
In deciding upon an operation for this condition the physician will do well to follow no one method of procedure, but to have several in mind, choosing each according to the needs of the case. The simplest operation for a tear at the outlet of the vagina is that which is known as the flap-operation, ascribed to various writers and operators. It consists in putting the parts upon the stretch by applying the fingers or thumbs of assistants below and external to the lowest point in the vagina, making an incision with scalpel or scissors across the septum between the vagina and rectum transversely, and dissecting up the prolapsed mucous membrane in the posterior vaginal wall, and at the termination of this transverse dissection making four cuts, two parallel with the lateral margins of the vagina and two extending downward and outward toward the ischio-rectal fossæ. The result of this incision is to create a freshened surface resembling a parallelogram, and to bring upward and backward the prolapsed mucous membrane of the posterior vaginal wall, which by reason of laceration had prolapsed downward and forward. The sides of this freshened surface are brought together laterally by interrupted sutures of silk or silkworm-gut, the needle entering through the skin on each side, emerging in the centre of the freshened surface, re-entering and again emerging through the skin of the opposite side. When the two lateral edges are brought together a few stitches are added above and below to bring together surfaces which need suture. If a small vessel is opened in the dissection, it is twisted or tied. The stitches are removed in from ten days to two weeks after the operation. The patient's bowels are moved on the second day after the operation, and the parts are kept clean by spraying them with boric-acid solution, normal saline solution, or bichloride, 1 : 8000, powdering them with boric acid and iodoform. It is not necessary to use the catheter, but the parts should be thoroughly cleansed after each micturition. An occulsion-dressing of antiseptic gauze should be kept over the vulva. The patient's limbs need not be tied, and she may turn in any direction desired.

This operation does nothing to restore the supports of the uterus and has little if any value in lacerations of the pelvic floor. It restores the skin-perineum and pushes upward and backward the prolapsed mucous membrane of the posterior and lower wall of the vagina. It is not a difficult procedure, but will disappoint the practitioner if it is performed for a laceration of the pelvic floor extending into the lateral sulci and resulting in the formation of a considerable rectocele.

To estimate rightly the condition of a patient who has sustained a tear of the pelvic floor she should lie upon her back and the parts should be exposed. The patient should then be told to strain or bear down, when there will occur a protrusion of the posterior vaginal wall

and behind it the anterior rectal wall, constituting a rectocele. If the labia be separated and the tissues be closely examined, the upper portion of the rectocele or the highest point of the original tear can usually be recognized. It is well to select that point in the centre of the posterior vaginal wall at which the beginning of the tear occurs. The physician should then inspect the two lateral sulci, when he will find that the tear extended up upon one or both sides of the vagina. The extent of the lateral tear should then be observed and also the condition of the sphincter muscle of the bowel. When these points have been made out, the method of operation to restore the parts may be intelligently determined.

FIG. 200.



Laceration of the pelvic floor and perineum at labor, with immediate suture, showing condition of the parts after complete recovery.

No method of repairing such an injury can be successful which does not aim at a twofold result: First, the restoration of the torn fascia at the sides of the vagina; and, second, the restoration of a perineal body between the vagina and the rectum. To accomplish these steps successfully the hypertrophied and cicatricial mucous membrane must be dissected off over an area marking the extent of the original laceration. The sound tissues at the sides of this area must then be united in such a manner as to bring together two distinct lines of suture; the one entirely within the vagina, restoring one or both lateral sulci and running in a direction nearly parallel to the surface of the bed upon which the patient lies upon her back, and the other line of suture extending perpendicularly to the floor or table and joining the first, whose function it is to bring together the skin-surfaces of the restored perineal body.

The instruments needed for this operation are a small scalpel,

needle-forceps, long dissecting-forceps, four pairs of light tenaculum-forceps, half a dozen hæmostats, long-handle scissors curved upon the flat, suture-material, preferably silk of two sizes, and small or medium-sized catgut. To prepare the patient for operation the bowels must be very thoroughly emptied in the manner already described. If it be found that the sphincter of the bowel is weakened, special care must be taken to have the intestine completely emptied, and to secure this the patient should be given such food for several days before the operation, that there will be little if any residue in the intestine. Such diet is preferably broth, soup, beef-tea, soft egg, with a moderate amount of toast or bread and a little tea or coffee. The field of operation should be prepared by removing the hair which may become soiled, and by douching the vagina with the green soap and creolin mixture already described, alternating with douches of bichloride of mercury, 1 : 2000. The cervix should be examined with the speculum, and, if a muco-purulent discharge is present, the cervix should be swabbed out with bichloride, 1 : 1000. As the operation may last for an hour or an hour and a half, the patient should have a stimulant before taking the ether, preferably whiskey or brandy, while stimulants should be at hand for hypodermatic use if needed. If assistants are not available, the operator should have a convenient form of leg-holder, so arranged as not to make undue pressure upon any portion of the patient's limbs. The patient should be placed upon her back at the edge of the table and the field of operation surrounded by clean linen. The operator's instruments should be made fully aseptic, and he should take every precaution regarding the disinfection of his hands and the cleanliness of his clothing.

The operator should first map out the field of operation by grasping, with a pair of tenaculum-forceps, the point in the middle line of the posterior vaginal wall which is the highest point of the rectocele and which shows the beginning of the original tear. He should also place a tenaculum-forceps upon the sides of the vaginal mucous membrane at the upper point where the tear in each sulcus begins. If moderate tension is made upon each of these four forceps, by examination it will be seen that the form of the surface to be denuded rudely represents a butterfly with extended wings, and that the tip of each wing represents the point in the sulcus at which the original tear began. The operator should then grasp the mucous membrane just below the upper and central tenaculum, and with his scalpel outline the flap for denudation by cutting lightly through the tissue in a line extending between each of the tenaculum-forceps. Having outlined the flap, he may begin at the highest point of the sulcus upon his left hand, and gradually dissect up the flap of the thickened mucous membrane following the outline. Some operators prefer to use a scalpel for this dissection, while others begin the raising of the flap with a scalpel and then employ scissors, sharp-pointed and curved upon the flat.

Care should be taken not to buttonhole the flap, as this results in imperfect freshening of the tissues, and may lead to imperfect union. When the dissection is complete any small vessel which may spurt should be caught by hæmostatic forceps and twisted. Ligature of

such vessels is rarely necessary, but should be done with fine catgut if required.

In passing the sutures to unite the tissues the physician should begin at the top of the lateral sulci and close the tissues by continuous suture of fine silk or catgut or by interrupted suture with larger silk until the line of suture comes to the central line of the vagina. A similar procedure should be carried out upon the opposite side. The tear is now converted into a simple laceration of the perineal body in the central line. This should be closed by interrupted stitches of silkworm-gut or silk, and the stitches should begin at the last point of the denuded surface nearest to the rectum. These stitches should be carried upward until they meet the two lines of suture from the lateral sulci. The tissue which forms the tip of the central portion of the denuded area should then be brought down into the central line, so that the last stitches shall include this tissue in their circuit. In passing the first stitch of this central line, namely, that next the bowel, care should be taken to pass the needle sufficiently deeply to bring together any torn portions of the fascia and muscle forming the sphincter of the bowel. These stitches in the central line may be of medium-sized silk or of a silkworm-gut. If silk be employed, the stitches may be cut short; while if silkworm-gut is used, they should be left long, and the ends tied together in a knot. Before the stitches are tied the tissues should be thoroughly douched with bichloride solution, 1 : 8000, or carbolic acid or creolin, 2 per cent. The parts should then be freely powdered with iodoform and boric acid, and the vulva covered with an occlusion-dressing and antiseptic gauze.

The after-treatment of these cases is usually uncomplicated. If difficulty is experienced in urination, the patient may be catheterized every eight hours. The stitches should be kept thoroughly clean by a spray of boric acid, a teaspoonful to the quart of hot water; by bichloride solution, 1 : 8000; or by a salt-solution, two teaspoonfuls to the quart. The stitches should be cleansed after each micturition and defecation, averaging two or three times in twenty-four hours. The parts should then be thoroughly powdered with iodoform and boric acid and the vulvar dressing renewed. The patient's bowels should be kept closed after the operation for twenty-four hours by the injection of codeia, one-half grain hypodermatically, and repeated if needed, or by the insertion in the rectum of an opium suppository, for which the following is a useful formula:

Aqueous extract of opium	gr. $\frac{1}{2}$.
Extract of belladonna	gr. $\frac{1}{8}$.
Iodoform	grs. $2\frac{1}{2}$.

Cocoa-butter sufficient to make a rectal suppository.

The after-history of these patients is usually uneventful. The stitches may be allowed to remain for ten days or two weeks. They should be removed with antiseptic precautions and the vagina thoroughly douched after their removal. A discharge of bloody serum is usual in these patients during the first five or six days after the operation. If thorough antiseptic precautions have been taken, the patient will have no

fever, nor will a purulent discharge be formed. The patient should remain in bed at least two weeks after the operation. The bowels should be moved on the second day; although there is not much danger of injuring the sphincter in these cases, still the precaution should be taken before the first fæcal matter is expelled to inject into the rectum four to six ounces of warmed olive oil. After the bowels are thoroughly emptied the patient's diet may be increased.

The complications which may arise after this operation are hemorrhage and septic infection. It is rare for the bleeding to assume dangerous proportions, as no large vessel is severed. Persistent oozing, however, requires the application of antiseptic gauze and a tampon.

The patient should be convalescent from this operation in three weeks and able to sit up in bed by that time.

When the septum between the vagina and rectum has been opened the tear is said to be a complete one, and the rectum and vagina open with the same orifice. In these cases there always ensues some loss of tissue through absorption of the bruised and torn tissues just above the rectum. As a result of this the operator will find the torn ends of the sphincter considerably retracted, while above the opening of the bowel occurs an oval opening, which is seen to be the common joining of the rectum and the vagina. In many of these cases the condition of the patient is a very pitiable one. The mucous membrane of the rectum often becomes very irritable, and attacks of obstinate diarrhœa greatly weaken the patient. Some women are so troubled with persistent diarrhœa that they are obliged to limit the diet during the warm months of the year to liquids, especially avoiding milk on account of the formation of its curd. Another difficulty is found in the fact that the ends of the torn sphincter muscle are considerably atrophied, and hence the operator is dealing with weakened and attenuated tissues as well as with the torn and injured muscle. The after-care of these patients requires good nursing and thorough antisepsis, and hence operation for the relief of these cases should not be undertaken unless such assistance can be procured. Many women are content to suffer from this complication rather than to undergo the inconvenience and prolonged confinement to bed after an operation.

The instruments required for the closure of a complete tear of the pelvic floor and perineum are the same as already described in dealing with the incomplete or partial laceration. As the operator will be obliged to bury a portion of the suture, he must select catgut in which he has absolute confidence, or if he cannot obtain that which he knows to be aseptic, he had better rely upon thoroughly boiled silk. This for buried sutures should be of small size and not of the firmest and closest texture. The needles required for this operation are short, fully curved needles for the continuous buried sutures, and large, fully curved needles for the interrupted sutures which complete the operation. As it is not unusual to open small vessels, fine silk or catgut suitable for ligature should be available. A clean catheter should be at hand, and, if the operator prefers, a long piece of rubber tubing to drain the bladder continuously for a few days.

The preparation of these cases requires careful attention to the

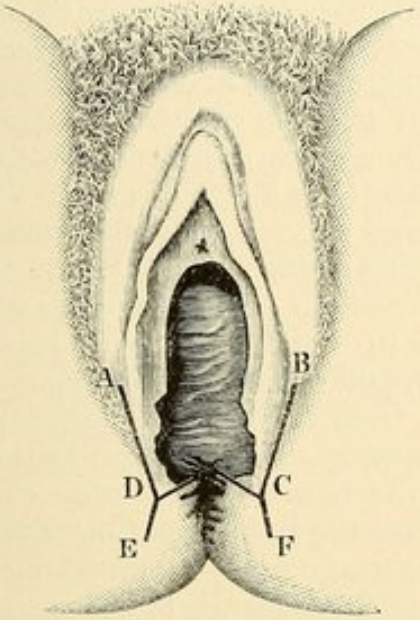
intestinal canal. The patient should be put to bed for four or five days before the operation. Her bowels should be thoroughly emptied by calomel and soda at night followed by a saline in the morning, until the tongue is perfectly clean and the abdomen perfectly flat. Her food meantime should be chicken-broth, mutton-broth, beef-tea, beef-juice; soft egg, small amount of bread and toast, and a limited amount of tea or coffee. Plenty of water should be taken. It is always good surgery to examine the urine of a patient who is to be anæsthetized for a considerable time, and should evidence of kidney-failure be present this must be remedied by appropriate treatment. The parts should be made thoroughly aseptic by repeated douches of green soap, one at night and one in the morning, with a single douche of bichloride, 1 : 2000, at mid-day. The mucous membrane of the rectum should be irrigated as well as that of the vagina, in order, if possible, to prevent the passage of bacteria into freshly cut surfaces. The patient should be anæsthetized by ether, having been prepared by shaving the hair away from the parts, thoroughly scrubbing them with soap and water, rinsing with water, scrubbing with bichloride, 1 : 2000, and again with alcohol. The physician must thoroughly sterilize his instruments by boiling with soda for half an hour and placing them in carbolic solution, 2 per cent., or in sterile water. He will require a small amount of antiseptic gauze, cut into convenient strips for tamponing, and also a supply of iodoform and boric acid and bichloride-gauze. Some operators prefer to use marine sponges suitably antisepticized, while others attach to the hose of a fountain-syringe a finely drawn nozzle which permits a very fine stream of sterile water or salt-solution to play upon the parts.

The patient should be placed upon her back at the edge of a table and her thighs held by assistants or by a suitable leg-holder. The plan of operation which is most feasible to the greatest number of cases and which has the advantage of removing no tissue, consists in splitting the tissues between the rectum and the vagina, thus separating these two canals.

If this be done, the posterior wall of the vagina can be raised and drawn upward and backward, while the anterior wall of the rectum should be drawn downward and forward. This anterior rectal wall has been torn in the central line by the birth of the child. The first province of the physician in suturing must then be to bring together the two lateral halves of this anterior wall by continuous suture, which is to be buried. In order to loosen the anterior and posterior flaps it is necessary to make an incision upon each side of the vagina just at the inner border of the cutaneous surface, where the tissue of the skin becomes the mucous and cutaneous tissue at the edge of the vagina. These incisions should be prolonged upward to the lower border of the lesser labia. At the point where the rectum and vagina join these incisions are turned transversely toward the median line, to loosen the two flaps. When this is completed, the lateral incisions are then prolonged downward and slightly outward, in order that the torn ends of the sphincter muscle may be loosened and made available for suture. This dissection is sometimes accompanied by hemorrhage, but the

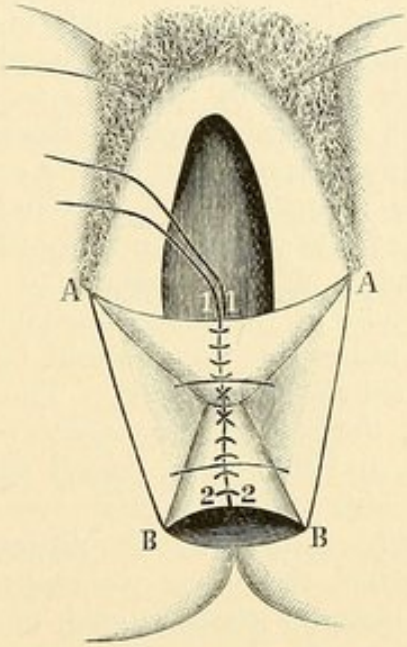
vessels rarely need more than torsion by hæmostatic forceps. The lines of the flaps must be by a sharp, small scalpel, while the dissection itself can be accomplished with the knife or sharp-pointed scissors curved upon the flat. When the flaps have been thus separated, as has been stated, the first province of the operator is to begin his line of suture at the highest point of the rectal tear and bring together the tissues of the rectum. For this purpose he should select a small, fully curved needle, round or Hagedorn, and threaded with fine catgut or fine silk. His first stitch should begin just above the point of laceration and should be passed through the tissue above the mucous membrane, endeavoring if possible not to open into the lumen of the bowel.

FIG. 201.



A D, B C. Lateral incisions at labial border. *D E, C F.* Prolongation of these incisions to loosen ends of sphincter muscle. At points *D* and *C* incisions are carried toward central line to split recto-vaginal septum.

FIG. 202.



Closure of complete laceration. *A B, A B.* Lateral incisions. 1 1. Continuous suture closing flap, making new posterior vaginal wall. 2 2. Continuous suture, closing flap, making new anterior rectal wall.

This stitch should be tied and the suture-material held lightly by an assistant. With dissecting-forceps the operator then brings together the two edges of the torn rectal tissue, uniting them with the continuous over-and-over stitch. He thus repairs the torn rectal wall down to the sphincter. If the ends of this muscle are plainly found, he may bring the muscle together by this continuous stitch. If not, it is well simply to join the mucous membrane of the rectum, leaving a full dissection to expose the muscle. The lower end of the rectal stitch should not be tied, but the needle and unemployed suture should be wrapped in antiseptic gauze and intrusted to the assistant. Selecting a freshly cut, continuous suture, the operator should then begin at the upper point of the mucous membrane of the vagina, which is raised and drawn gently upward and backward by a light tenaculum-forceps. Beginning at the uppermost point the operator then brings together these tissues by continuous suture, making the approximation as

accurately as possible. As the tenaculum-forceps draws the tissue upward and backward the line of suture gradually covers up the mucous membrane of the vagina, and carries upward and backward the point of redundant tissue which formed the anterior surface of the rectocele. This line of suture in the mucous membrane of the vagina is usually longer than that in the rectum, and when completed has repaired the floor of the vagina to the extent of the original laceration. This continuous vaginal suture should not be tied at its lower point, but, if possible, the needle should be wrapped in gauze and held until the other sutures are inserted.

The operator has now converted the complete laceration into an incomplete. There remains a quadrilateral figure whose sides are formed by the cut edges of the skin in the lines of incision whose upper portion or head is the newly made wall of the vagina, while its lower portion or base is the recently repaired rectal wall. This space is to be closed by bringing together the skin-edges, and this is accomplished by interrupted sutures. Silk of medium size is best adapted to this purpose, and a fully curved, large needle, round or Hagedorn, is to be used. The first and most important stitch is at the lower end of the surface, and should be so passed as to include the sphincter-muscle. It is necessary in placing this suture to go down upon the sides of the intact portion of the muscle, in order that the ends of the muscular tissue should be gathered up and brought well together toward the middle line. The needle should be introduced upon one side, the sixteenth or eighth of an inch from the edge of the skin-surface, and should be passed sufficiently deeply to include the sphincter and also the connective tissue above the mucous membrane of the bowel. The needle should pass just above the line of continued suture by which the operator closed the mucous membrane of the rectum, and the operator should avoid, if possible, penetrating the bowel with this suture. If this is carefully passed, it will bring together the fascia and muscle-tissue of the sphincter, and will form a most efficient means of securing union. If sufficient dissection has not been already made to secure this result, the operator should prolong his incisions downward and outward, and also backward into the vesico-rectal region until the sphincter is perfectly free. When this stitch has been passed the remaining portions of the ununited skin-edges should be brought together by interrupted silk stitches, placed one-eighth to one-quarter of an inch apart. To pass these stitches the needle should be introduced sufficiently far from the edges of the cut skin to secure a firm hold, and the needle should be carried downward, emerging in the centre of the space below, re-entering and again emerging upon the opposite side. If the needle is passed at each stitch, not only downward through the tissues, but also a little upward and backward, a better result is obtained. When these stitches have been placed they should be tied, beginning with the last one from below upward. If any ununited surfaces are left when these stitches are tied, the continuous suture at the lowest extremity can be utilized in joining them, and also the continuous suture at the upper extremity. If the dissection at the sphincter muscle has left ununited surfaces, an additional

interrupted stitch of silk may be needed to repair them. The stitches are then cut, when the vagina and rectum are douched with bichloride, 1 : 8000, and the surfaces are freely powdered with iodoform and boric acid. Hemorrhage during this operation is generally inconsiderable and should not embarrass the operator. The patient's knees are then brought together, a pad placed between them, and her legs bandaged at the knees and also at the ankles; a vulvar occlusion-dressing is retained in place by a T-bandage. The bladder should be catheterized at the completion of the operation. If suitable care cannot be obtained, the bladder may be continuously drained by catheter for the first few days. As a rule, however, it is better not to employ this expedient.

Cases are occasionally seen in which a patient upon whom this operation has been done, upon waking from the anæsthesia, becomes partially delirious, complaining of acute pain, and by straining and bearing-down efforts may tear asunder the recently united tissues and produce severe hemorrhage. This may happen especially in hysterical and nervous patients. To obviate this the patient should be given a hypodermatic injection of one-quarter grain of sulphate of morphine combined with $\frac{1}{200}$ of a grain of atropine. Some operators prefer to employ codeia, giving one grain by hypodermatic injection, while others use rectal suppositories of aqueous extract of opium. Such may be made after the following formula :

Aqueous extract of opium	gr. 1.
Extract of belladonna	gr. $\frac{1}{4}$.
Iodoform	grs. $2\frac{1}{2}$.
Cocoa-butter sufficient to make one rectal suppository.	

Others prefer the ordinary rectal suppository of the Pharmacopœia, containing one grain of opium. The patient is then placed in bed on a moderately hard mattress, and should be attended by a nurse until she is perfectly conscious after the operation. The presence of the nurse will prevent violent or straining movements, and often control at this time is essential for the success of the operation. The fact that many of the sutures pass through the skin in one of the most sensitive parts of the body seems to predispose a nervous patient to intense pain immediately after the operation. The patient should be given sufficient morphine or codeia to relieve her pain and to prevent the passage of the bowels for three days. With trustworthy nurses the nurse may be intrusted to give a hypodermatic injection of one-eighth grain of morphine as often as is needed. If no such trustworthy person is at hand, the physician must prescribe the dose at stated intervals, seeing his patient as often as is necessary for the first three days. The patient should be catheterized every eight hours unless the bladder is continuously drained. She may be cautiously turned upon her side, but the knees and legs should remain bandaged together. Her diet should consist entirely of food which will leave little or no residue in the intestine, and should be essentially that which she had while preparing for the operation. Hemorrhage rarely occurs as a secondary complication unless the patient has become uncontrollable and torn the tissues asunder. The after-care of the sutured surfaces in these cases consists in

keeping them scrupulously clean with antiseptic applications. Many prefer not to use douches with these patients, but every eight hours, especially after micturition or defecation, to cleanse thoroughly the parts with bichloride solution, 1 : 2000 or 1 : 4000, and then to powder them freely with boric acid and iodoform. Others prefer to use a spray of normal saline solution or bichloride, 1 : 8000, or carbolic acid, 1 per cent., followed by the use of antiseptic powder. A vulvar occlusion-dressing of bichloride gauze, 1 : 2000, and a borated cotton-pad should be constantly worn and kept in place by a T-bandage.

The first movement of the bowels after such an operation is a matter of great importance. The operator should prepare the patient by administering laxatives of such a nature as will completely soften the fecal matter to be passed. It is well to give on the night preceding the moving of the bowels a grain of calomel with two or three grains of sodium bicarbonate. On the following morning the patient may take a bottle of citrate of magnesia in two or three doses, or she may take a half-ounce of Epsom or Rochelle salt. A nurse should be in constant attendance, and as soon as the patient has an inclination for a bowel-movement the nurse should very carefully inject into the rectum, through an English catheter or a small rectal tube, four to six ounces of warm sterile olive oil. This should be passed up as high as convenient, and the injection should be given slowly and with great gentleness. This will usually result in protecting the rectal surfaces, insuring the smooth passage of feces and preventing straining and injury to the parts. If the first bowel-movement is successfully accomplished, the bowels may be moved every second day thereafter for the next four to six days. The patient's diet may be somewhat enlarged, to include soft egg, a small amount of easily digested meat, and a moderate amount of fresh fruit in season. A large amount of vegetables should be avoided, and the patient should be given laxatives sufficient to insure a soft condition of the feces. The oil-injection should be practised before each bowel-movement for the first eight days after the operation.

The operator must not be surprised if the patient does not immediately regain control of the sphincter-muscle. In many cases it is ten days or two weeks after the operation before great improvement in this direction can be observed. If, however, the wounds do not become infected and a good union is obtained, the gradual contraction of the tissue will usually give to the patient a satisfactory control over the bowel. The stitches should be removed in ten days to two weeks after the operation. To accomplish this the patient should be placed upon her back upon a suitable table and in a good light. The operator will require for the removal of the stitches one or two pairs of hæmostatic forceps, a curved director, and long-handled scissors, sharp at the point. The patient's thighs should be separated by assistants or by a leg-holder. The removal of the stitches in the skin-perineum is an easy matter. As regards, however, the continuous sutures, the operator may cautiously endeavor to remove the knot at the upper portion of the vaginal suture if it be found remaining. The same is true of the knots at the lower portion of this suture, and also any knots of continuous suture which may be found about the rectum. If silk has been used, it is often

possible to withdraw nearly the whole or the whole of the suture without in the least injuring the condition of the tissues. Under antiseptic precautions and with good nursing the results of this operation are excellent.

The patient should remain quietly in bed for three weeks after the operation. On the fourth week she may sit up in bed and be about for a portion of the day. At the end of four weeks she may be up and about, and at the end of six weeks she should be thoroughly convalescent. The patient should be cautioned to avoid sexual intercourse for a number of months after this operation, lest injuries to the tissues might occur and newly healed surfaces be torn asunder.

Cases are occasionally seen in which the abdominal wall does not undergo a normal involution after labor. This may not go to the actual point of hernia; but if the patient's occupation exposes her to constant standing, and if her clothing is improperly adjusted, a hernia may develop. This condition is the result of atrophy and dilatation of the recti muscles, with the protrusion between them of mesentery and peritoneum and sometimes intestine. It exposes the patient to constant annoyance from the presence of the tumor, and the condition disturbs the peristalsis of the intestine, while the hernia tends constantly to increase, and strangulation is always a possibility. In view of these facts the cure of this condition when well pronounced is desirable.

In ventral hernias of slight extent the patient may derive comparative comfort from the wearing of a suitable pad and bandage. The pad should be preferably of some elastic but soft material, such as a cushion of horse-hair covered with flannel, or a perfectly smooth object like a pad of hard rubber. It is best retained in place by a completely fitting body, which is supported from the shoulders and which is prevented from drawing up by two bands passed beneath the groins. Other forms of bandage are rarely efficient, compressing the tissues imperfectly. The constant course of any abdominal bandage is to slip up toward the axillæ, at once defeating the purposes for which it is worn.

In diagnosticating a condition of ventral hernia, and especially before deciding upon operation, it must be distinguished in diagnosis from other abdominal tumors. Ovarian cysts, hydatid cysts of the abdominal cavity, aneurism of the abdominal aorta, and phantom-tumor of the abdomen may occasionally simulate ventral hernia. The differential diagnosis is to be made by palpation, when the tumor in hernia can be reduced, the edges of the ring plainly felt, and the sac grasped by the fingers of the examiner. Coughing gives a marked impulse to the hernia, while the absence of the fluid-wave proves that it is not dropsy or ovarian cyst.

The operative treatment of ventral hernia is most satisfactory in its results. If the patient be very much emaciated and in very weak health, she should be gotten into fairly good condition before an operation is performed. If this be not done, cicatrization will be less firm and complete, and the danger of the recurrence of the hernia will be very much greater. The presence or absence of adhesions in such a hernia can never be absolutely foretold. As a rule, adhesions are not

present, although they may be encountered. The preparation of the patient for operation consists in thorough purgation by mercury and by salines. The patient's diet should be confined to broth and soup, a small amount of bread, or an egg for two days prior to the operation. The abdomen is to be prepared by very thorough scrubbing with soap and water, with special attention to the umbilicus. This should then be rinsed and scrubbed again with sterilized water, followed by cleansing with bichloride, 1 : 2000, and last by alcohol. If the umbilicus resists cleansing, ether should be employed to dissolve any retained secretions of the skin at that point. A gauze antiseptic dressing should be placed upon the abdomen after it is cleansed. The instruments required for the operation are knife, scissors, hæmostatic forceps, curved and straight needles, needle-forceps, and tenaculum- or dissecting-forceps. The suture-material employed should be silk, fine and coarse, or catgut if that which is absolutely sterile can be secured. The dressings required will be bichloride-gauze, and strips of adhesive plaster three inches wide and half a yard long should be in readiness. The operator should take all possible antiseptic precautions. When the patient is anæsthetized by ether she should be placed upon a table having a Trendelenburg attachment, which should be slightly raised. The operator should make an incision over the lowest and most prominent part of the abdomen in the median line, opening the abdominal cavity. It should be remembered that the abdominal wall is exceedingly thin over these tumors, and care should be exercised in making the dissection. The finger should then be introduced and the sac of the hernia thoroughly explored to detect the presence or absence of intestinal adhesion. If these are absent, the operator may enlarge the incision over the entire tumor; while if adhesions are present, he should extend the incision only to the point of nearest adhesion, and he should try gently to separate the tissues by his fingers before incising the abdominal wall. If this is impossible, the incision should be prolonged over the whole extent of the hernia, carried down to the points of adhesion, which should be ligated and cautiously separated. When the sac of the tumor is thoroughly laid open the next problem will consist in the removal of the sac and the building up of a new wall of the abdomen.

In many cases a mass of omentum is contained in the sac of the tumor, which is adherent. This must be loosened, ligated in sections, and removed. If the amount is not redundant, it may be left and allowed to form the anterior wall of the abdomen as before. When all adhesions have been separated and the omentum has been dealt with, the operator should introduce a very broad, thin, marine sponge, made thoroughly aseptic, or an antiseptic gauze pad, or a sterile towel wrung out of hot water. The purpose of this is to protect the intestines, completely shutting them off during the removal of the sac. When this is accomplished the sac should be excised, cutting around its edges, and entirely removed. The edges of the sac, which are the edges of the recti muscles, should then be brought together by continuous suture, bringing the aponeurosis of the muscles into accurate apposition. This suture may be of fine silk or of sterile catgut. It should be inserted

from above downward, and just before its completion the sponge, pad, or towel in the abdomen must be removed. If necessary, the aponeurosis may be loosened from the overlying skin in order that this portion of the sac may be made as strong as possible. When this has been completed the skin should next be brought together by interrupted sutures of silk. When this is finished the line of incision should be heavily powdered with iodoform and boric acid, a dressing of bichloride-gauze applied with cotton, and adhesive strips placed over the dressing, being attached to the patient's sides. If the strips are properly placed, there will be no necessity for an abdominal or many-tailed bandage.

The after-treatment of these cases is usually not attended with complications. The patient's bowels should be moved on the day following the operation, and they should be made to move at least every second day. The stitches should be allowed to remain two weeks before the wound is dressed, the patient meantime assuming any natural posture while recumbent in bed. When the stitches are removed at the expiration of two weeks, the wound is usually found united. The patient should not be allowed to sit up or get up for three or four weeks after the operation. Before walking about, she should be supplied with a proper abdominal bandage. Her return to her usual occupations, especially if she be a workingwoman, should be made as gradually as possible.

The result of this operation is usually successful, union occurring without special difficulty. The question of a return of the hernia, however, depends considerably upon the general condition of the patient. Women with thin and wasted muscles are especially liable to a second hernia, while the stretching which the tissues sometimes endure in these cases is very great. This is best prevented by avoiding severe exertion, by the wearing of a suitable bandage, and by attention to the general health and condition.

Varicose veins in the legs and thighs are occasionally so aggravated in the pregnant condition as to require operation after the patient's recovery from labor. While the ligature of the vein is a comparatively simple matter, the results are much less satisfactory than when, under thorough antiseptic precautions, a considerable portion of the venous trunk is excised. The operation should be performed after suitably preparing the patient by rest in bed, with the leg elevated for several days. Thorough antisepsis of the external surface of the leg should be carried out. The instruments required are a small, sharp scalpel, hæmostatic forceps, needles and silk, and a blunt, curved needle upon a long handle. Dissecting-forceps will also be required. When the patient is ready under ether the operator makes an incision over the vein corresponding to the area which he proposes to remove, and he dissects down to the vein. The vein should be carefully isolated and completely freed from its attachments. It should then be ligated with thoroughly aseptic silk, care being taken that the ligature lies perfectly smooth. An inch or two of the trunk of the vein should be removed from between the ligatures, care being taken to see that the ligature is not applied too near the end of the cut portion and that the ligation is complete. When this is accomplished the edges of the skin-incision

should be brought together by a continuous stitch of sterile catgut. A pad should be placed over the site of operation, composed of antiseptic gauze, and a dressing applied covered by a flannel bandage, which is begun at the toes and extended upward over the site of operation to the groin. The infected leg should be elevated and disturbed as little as possible. Most of these cases recover without complications when antiseptic precautions have been thoroughly carried out.

Cases are occasionally seen in which patients after labor suffer from protrusion of the anterior vaginal wall and also of the tissues about the urethra. The first is termed cystocele, and is usually the result of hard and continued labor in a weak and poorly developed patient. It is accompanied by a prolapse of the uterus to some extent, and is annoying to the patient, because the prolapsed portion of the bladder allows the retention of urine, which readily becomes partially decomposed, giving rise to unpleasant symptoms of irritation. The symptoms of cystocele are a tumor between the labia and irritability of the bladder, with pain at the time of micturition. The cure of this condition is by operation only. It has no palliative treatment that is worthy of consideration.

To prepare a patient for this operation the bladder should be thoroughly douched with a 1 per cent. solution of creolin night and morning for several days. This is readily accomplished by a soft catheter to which are attached by glass tubing a funnel and connecting-tube. If the bladder be distended with the antiseptic, the fluid may be siphoned off without difficulty. The parts about the vulva should be washed and the vaginal mucous membrane thoroughly disinfected by the use of green soap and creolin, as advised in treating of operation upon the posterior vaginal wall. The question as to permanent drainage of the bladder will depend very much upon whether any condition about the urethra is found calling for operation at the same time that the cystocele is treated. If no such condition is present, the bladder should not be continuously drained. The instruments required for the operation will be a small scalpel, scissors curved upon the flat, hæmostatic forceps, four pairs of light tenaculum-forceps, dissecting-forceps, needle-holder and needles, preferably curved, while a large depressor or speculum may be useful in depressing the posterior wall of the pelvic floor. The instruments should be thoroughly sterilized, and also the arms and hands of the operator. The patient should be anæsthetized by ether, the bladder being emptied and douched, the parts made thoroughly clean and aseptic, and the field of operation surrounded by sterile linen. The operator, when seated before his patient, has her thighs separated and carried backward, which exposes the field of operation. The retractor having been placed in the posterior wall of the vagina, the anterior wall will be seen protruding. The operator carefully selects four points upon this tissue. It is often impossible to ascertain the presence of any scar-tissue in the anterior vaginal wall which would indicate a laceration at the time of labor, and the best that can be done is to determine upon the size of the flap of hypertrophied tissue which the operator proposes to remove from the surface of the cystocele. This is to be determined by grasping with tenaculum-forceps at the highest

point in the median line, to which the dissection is to be carried, by selecting also the lowest point in the median line, and by placing tenaculum-forceps midway between these two points on either side at the outermost edge of the proposed denudation. These forceps should be intrusted to assistants, who should make gentle but constant tension upon the instruments. When these are drawn partially tense, it will be seen that a diamond-shape figure has thus been outlined. Operators usually prefer to make the shape of the dissection an ovoidal one rather than to adhere to the straight lines of the diamond. The operator should grasp the tissues just below the highest tenaculum-forceps with the dissecting-forceps, and with the scalpel dissect away a flap of hypertrophied mucous membrane. The operator must avoid two dangers—one of cutting too deeply, when he may open the bladder, and the other of cutting too far anteriorly, when he buttonholes the flap. If small vessels spurt as the denudation proceeds, they must be caught by hæmostatic forceps and twisted. Some prefer to employ scissors in the denudation, outlining the flap with a knife. When the dissection is complete the operator must determine the sort of suture to be used with reference to the size of the denuded surface and the condition of the tissues. Where the exposed surface is extensive, it is better to make two lines of continuous suture, forming a strong scar to prevent the occurrence of the original condition. The first should be taken in the central line of the denuded area, occupying fully one-half of its length. The submucous and connective tissue should be covered up by the continuous suture, and brought together by the over-and-over stitch. Fine silk or fine catgut is to be used for this purpose. When this is done, the cut edges of the hypertrophied mucous membrane should be brought together also by a continuous suture beginning from the highest point. The result of this operation is to replace the prolapsed portion of the bladder, and to substitute for the stretched and weakened vaginal wall the double line of firm scar-tissue. The vagina should be thoroughly douched and the parts heavily powdered with iodoform and boric acid. No dressing is needed immediately applied to the sutured surface, although some prefer to tampon the vagina lightly with iodoform- or bichloride-gauze. An occlusion-dressing should be worn over the vulva of bichloride-gauze, retained in place by a T-bandage. The patient should be catheterized for several days; the parts should be thoroughly douched with bichloride, 1 : 8000; carbolic acid, 1 per cent.; normal saline solution or boric acid, one teaspoonful to the quart of hot water, after each micturition and defecation. The patient may assume any posture in bed which is comfortable.

The results of this operation are generally very satisfactory. It is rare for infection of the tissues to occur. The sutures are usually absorbed without difficulty, and, if the patient be examined two or three weeks after the operation, it is possible that even the knots will have disappeared. It is well in these cases to see that there is no malposition of the womb which should cause protrusion of the bladder and the vaginal wall. If required, a pessary should be worn for a little time until the sutured tissues are firmly united.

CHAPTER VI.

INSANITY AND NERVOUS DISORDERS ACCOMPANYING THE PUERPERAL STATE.

One of the comparatively rare and very serious complications of the puerperal state is found in acute mania. This is seen in patients who have labored during pregnancy under great mental strain, either from the effect of illegitimate pregnancy or by reason of some overwhelming anxiety or sorrow. Patients who inherit mental and nervous disorders are naturally more prone to anxiety after gestation. Women who have been accustomed to the excessive use of stimulants or narcotics are likewise more apt to suffer from this disorder. In most cases infection of some sort is undoubtedly the cause of the difficulty. Septic infection not infrequently results in a condition of mental derangement. Toxæmia is very frequently present in these cases. Young and ill-developed women or women above the average age of childbearing are most susceptible to this affection. The character of labor does not seem to influence powerfully a patient in this regard. Cases develop after easy labor, while others are seen where the extraction of the child has been attended with difficulty.

The symptoms of puerperal mania are mental aberration, usually of a melancholic and suicidal form. If infection be present, its presence is announced by variations in temperature. If puerperal sepsis complicates the case, the usual symptoms of that condition are at hand. When toxæmia is the exciting cause, deficient excretion, impaction of the intestines with feces, and the peculiar character of the pulse and temperature assist in diagnosis. The patient frequently becomes violent, attempting either the destruction of herself or of her child. She often refuses to nurse the infant, manifesting either apathy or marked aversion to it. She is usually enraged with her attendants, and often attempts personal violence. If the case be one of infection, the prognosis for recovery is bad, as a rule. If severe toxæmia exists, the issue is usually fatal. If but a mild form be present, appropriate treatment may result in cure.

It is of special interest in these cases to differentiate between puerperal septic infection and autoinfection or toxæmia. In the first the characteristic of inflammation, rise of temperature, is present, the temperature being lower in the morning than in the afternoon. The lochial discharge is or has been foul. Involution of the uterus is delayed. An exudate or swelling may be found in the pelvis. The patient may have diarrhœa or constipation. Thrombosis about the pelvis or pyæmic abscesses may develop. Embolic pneumonia may also occur. Treatment by sponging and packing, with free doses of alcohol and forced feeding, gradually bring about an improvement.

In cases in which toxæmia is the exciting cause the patient's excretion

has been deficient for some time. In some women the amount of urea and solids in the urine is markedly deficient. In others the urine is unaltered. The temperature in toxæmia may rise to considerable height at any time of the day or night. In severe and fatal cases the temperature does not drop and does not alter a degree in several days. The temperature is high in proportion to the activity of the patient's mania. Examination of the genital tract finds no evidence of septic infection. The lochia is not foul, the uterus undergoes involution, there is no exudate or swelling in the pelvis, while pyæmic abscesses or pneumonia do not develop.

Treatment by local sponging, enforced feeding, accomplish nothing. The bowels are moved only by purgation, and in some cases impacted feces can be recognized by palpation. The patient refuses food in many cases. A catarrhal hypostatic pneumonia of both sides develops. The kidneys become affected by the constant effort to eliminate ptomaïnes, and the patient finally perishes from exhaustion or cerebral effusion, with a temperature of 108° or 109° F.

The treatment of this condition depends upon the recognition, if possible, of the exciting cause, and is symptomatic. When the case is one of hereditary insanity, isolation, life in the country, kind attendants, fresh air, good food and nursing, and at times seclusion from the child, are all that can be done. Where the case is one of puerperal septic infection this must be treated accordingly. Where toxæmia is present vigorous elimination only will be of decided value. In employing sedatives in this case, codeia should be preferred to opium or morphine, because it less deranges excretion. Hydrate of chloral, if the patient be strong, is also beneficial.

Patients are occasionally seen who suffer from obstinate neuralgia in the pelvic region after labor. This symptom should at once direct attention to the possibility of compression of nerve-trunks by an inflammatory exudate in the pelvis. An examination should be made to determine the existence of such exudate, and, if such be found, the patient should be treated by saline purgation, rest in bed, counter-irritation, hot douches, and tonics addressed to the blood-making powers of the body.

In other cases no anatomical cause can be found for this disorder, and the patient must be treated for the anæmia which underlies the condition. Obstinate pain in one of the lower extremities, when accompanied by swelling of the leg, points to thrombus of the femoral vein as its most probable cause.

Cases are occasionally seen in which hysteria in some of its many forms develops after childbirth. This commonly occurs in women of bad nutrition and who have been subject before labor to hysterical paroxysms. While the nervous condition itself is of little importance, it serves to indicate the fact that the patient is in a depressed and anæmic condition and that she rquires careful recuperative treatment. She should not nurse her child, or at most should be permitted to nurse it but partially, while every effort must be made to enable her to rise above the general depression which produces the special manifestation. Epilepsy and chorea may complicate the puerperal state in those who

have been victims of these diseases before childbirth. These disorders reduce the strength of the mother, interfere with the successful nourishment of the child, and tend to prevent her return to a normal stage of convalescence. With the exception of removing the child from the breast, there is very little which can be done to influence these conditions. Treatment usually adopted for these cases is indicated, and the prognosis for improvement is not improved by reason of the existence of the puerperal state.

Functional nervous disorders of all sorts are especially annoying in the lying-in period, as they interfere with the patient's recovery and thus seriously affect her power of nourishing the child. Thus, headaches frequently recurring tend to depress seriously the mother's strength and often bring about a failure in lactation. The mistaken belief has been current that childbirth tends to cure some of the maladies of the nervous system. Quite the contrary, however, is true, for the additional strain upon the mother's strength tends to exaggerate rather than to cure pre-existing neuroses. The susceptibility of the nervous system in lying-in women is a matter of common observation with physicians. But a very slight exciting cause is amply sufficient to bring about a great change in the patient's temperature, solely through nervous influence. Thus, anger or grief, fright, or rage may throw a puerperal patient into a fever which will subside ofttimes within an hour from its beginning. When the disturbance is profound a curious effect is produced upon the milk, which may become a serious matter for the child. Children have been made violently ill by nursing from a mother who was in a greatly perturbed condition. The exact alteration in the milk in these cases is not known, but the fact that some important change occurs is abundantly confirmed by observation. A similar condition is seen in animals, and it is well known that a milch cow may have her milk rendered unfit for use by being chased, harassed, or worried. This susceptibility of the nervous system should be remembered in caring for puerperal women, and all sources of irritation, as far as possible, should be removed from them.

Many puerperal patients are exceedingly sensitive to changes in temperature. Within a short time after delivery, the cessation of muscular exertion in labor and the rapid cooling of the heated surfaces of the body cause a slight chill, which is a purely nervous phenomena and from which the patient rapidly recovers. Some women, however, who have had difficult labors are especially sensitive and susceptible to exposure to a very slight draught of air. This has probably had something to do with the popular fear lest a puerperal patient should catch cold. This condition is to be treated, however, not by depriving the patient of fresh air, but by clothing her suitably in woollen and by giving her an abundance of air, and, if the time of year permits, of sunshine as well. No greater mistake may be made than to reduce further the resisting power of such a case by keeping the patient in an ill-ventilated and overheated room. In patients who have been subjected to exhausting and prolonged labor the functions of the special senses are slow in regaining their vigor; thus such patients are troubled with weak sight for some time after labor, while others may have disturbances

of hearing, indicating a profoundly depressed nervous condition. Such functional disorders do not arise from structural changes in the nervous system, but are the result of the strain of pregnancy, culminating in the exhaustion of labor.

CHAPTER VII.

LACTATION.

By lactation we understand the formation of milk in the mother's breast and its transference to the child. In order that milk be properly formed in sufficient quantities the mother must be in good general condition, and must have well-developed and healthy breasts. Many women who are apparently strong and robust fail utterly in lactation without apparent reason. Others who seem frail furnish an abundance of nutritious milk which agrees with their offspring. The ability to form milk does not depend so much upon the mother's robust development, as upon the perfection of her glandular system and her nervous temperament. Well-formed breasts are those which are rounded in contour, the milk-ducts being well developed, while the nipple projects from the breast and can be conveniently grasped by the child.

In many patients a thin, milky fluid is present in the breasts during the greater portion of pregnancy. In others no fluid can be pressed out from the nipples, and the entire secretion seems to be formed suddenly after the delivery of the child. The secretion of milk is delayed by hemorrhage or exhaustion on the part of the mother, and in some patients by the use of an anæsthetic during labor. It is stimulated by the regular application of the child to the breast, by rubbing the breasts, and by the administration of drugs which help to maintain blood-pressure in these organs. In the majority of cases milk begins to come into the breasts between the second and third day after labor. Up to this time in healthy patients colostrum is present, increasing in amount until it is replaced by fully formed milk. In some patients milk goes into the breasts with a sudden sensation of turgescence, with stinging and shooting-pains radiating from the nipples. In some the axillary glands are suddenly enlarged, while in others the parotid glands and the subclavian tissues in the region of the neck are also swollen. An elevation of temperature to 100° or 101° F. may exist without septic infection, but in patients who have a distinct chill followed by fever to 102°, 103°, and 104° F., septic infection is present. As the breasts become filled they continue to sag downward, and the milk by gravity remains in the outer and lower portions of the breasts. Patients often suffer from weight and heaviness in these regions, and if the breasts be raised upward and toward the median line of the body, these disagreeable sensations are removed.

The pressure of milk in the breast gradually lessens as the adjustment of the amount formed and the quantity taken by the child becomes established. The normal capacity of the breast should furnish a natural indication of the amount necessary to feed a healthy child at each meal. Not more than two ounces are usually found at any one nursing in each breast for the first few days after the milk begins to come in. This quantity, however, soon increases to four and six ounces, which is the normal meal of a healthy nursing-infant of six to ten weeks old. The supply of milk frequently exceeds the capacity of the child, and this leads to the regurgitation of milk so frequently seen and esteemed by some as a mark of the child's vigor. This passive regurgitation is to be distinguished from vomiting. Regurgitated milk is not coagulated in firm clots, but seems to run easily out of the child's mouth in soft, white flakes, which are very friable. Regurgitation is a symptom of an abundant milk-supply and of a greedy child, and is to be met by shortening the interval of nursing or by causing the mother to grasp the nipple during nursing between two fingers, subjecting it to gentle compression and thus lessening the rapidity of the flow of milk.

In normal cases the child nurses every two hours, between six in the morning and ten in the evening, and but once during the night. If regularity be observed and the breasts be nursed in alternation, a balance will soon be reached between the demand and the supply.

The mother may suffer during lactation by reason of an excessive amount of milk. Painful distention of the breasts may result and acute suffering at the time when the child nurses. The treatment of this condition consists in removing the surplus milk by breast-pump before the child nurses. If the breast be thoroughly cleansed with saturated solution of boric acid and the nipples be drawn out gently by the thumb and finger, the glass bell of a breast-pump may be applied gently over the nipple and a vacuum created. It will be necessary to remove only a little milk to enable the child to nurse freely and relieve the mother. The amount to be removed must be carefully estimated, and just sufficient taken away to relieve the distention. If more than this is extracted, the breasts will be stimulated to furnish an increased amount.

The distention of the breasts which accompanies excessive secretion will be best relieved by gentle massage and by raising the breasts and by gently compressing them with an appropriate bandage. The base of this should draw the breasts upward and toward the median line. This may be accomplished by a figure-of-eight bandage or preferably by a breast-binder, to which are attached suspenders passed over the shoulders and crossed behind over the back. This binder is pinned or buttoned in the middle between the breasts, and by varying the attachment of the suspenders traction can be made in any desired direction.

Where the milk shows a tendency to accumulate in the milk-ducts, forming small lumps or areas of hardness, this can be largely obviated by gentle massage. Before this is done the breasts should be washed thoroughly with soap and water, and then with bichloride, 1 : 5000. The hands of the nurse should be thoroughly cleansed with soap and water, rinsed, and scrubbed in bichloride, 1 : 2000. Sterile olive oil

should be employed, as it aids very materially in maintaining a soft condition of the breast. The nurse should grasp the breasts gently with both hands at their base, raising the breast upward and toward the middle line. While one hand holds the breast in this position, the other should make gentle compression and stroking-motions from below upward. By alternating the action of the hands this may be done round the entire circumference of the breast, thus thoroughly relieving and softening distended lobules. Milk is frequently brought from the breasts during massage, an indication that engorgement is being relieved. If this manipulation is painful to the patient, it should be at once abandoned, and in place compression employed by a bandage as tight as is comfortable. Where an area of sensitiveness and redness develops infection has occurred, and massage will simply aggravate a beginning inflammation. Massage may be performed once or twice daily, and is often made more efficient if the excess of milk is removed by a breast-pump at the same time. Massage is also a stimulus to the flow of milk in cases where it is deficient. This fact should be remembered where massage is done for engorgement, and hence manipulation should not be repeated more often than is necessary to relieve overdistention. Massage of the breasts requires skill and gentleness and good judgment, and, when thus employed, it is a valuable method of treatment. If done, however, without such caution, it may cause considerable injury.

It is well to limit the amount of fluid which patients take who are annoyed by excessive secretion of milk. The mistake, however, must not be made to curtail a patient's diet too closely, thereby weakening the patient and decreasing her general strength. It is better to extract a considerable quantity of milk, and to allow the secretion to diminish slowly, than to underfeed the patient.

A deficient secretion of milk is most often observed in nervous women and in those who have been subjected at labor to great fatigue, hemorrhage, or shock. In the latter case, if stimulants and food are properly given, the patient will rally in a few days, and the secretion will rise to its normal amount. Where, however, a patient is neurotic or deficient in general nutrition, the physician must not wait for improvement in the patient's general condition, but must feed the child from the beginning, allowing it also to nurse the mother. The secretion of milk may be augmented by placing the child at the breasts at regular intervals, or by using the breast-pump regularly if there is no fluid to satisfy the child.

Gentle massage of the breasts is also an aid, while the application of the interrupted current of electricity, one pole being applied to the dorsal spine and one to the breasts, has been found of value.

The patient's diet in these cases should contain an abundance of fluid, with fat and a reasonable amount of sugar. Milk, soup, broth, cocoa, and gruels are indicated, with a free amount of water. Tea has a reputation among women as a stimulant to the formation of milk, while coffee is said to lessen the flow. Neither of these beliefs is based upon accurate observation.

Where the formation of milk is deficient, the assimilation of the patient

is usually at fault. The intestinal tract will be found sluggish in action, and often a constant tendency to malassimilation, as in the gouty or rheumatic person, is present. The peculiarities of each patient must be studied and the treatment prescribed accordingly. In gouty women who have been accustomed to eat largely of meat, beef and pork may be withdrawn from the diet and the lighter meats substituted. Such patients should take an abundance of water, and especially of the lightest alkaline or effervescing water. If milk itself cannot be well digested, it should be peptonized, care being taken that a considerable amount of cream is consumed with the milk. Many patients thrive upon an abundance of ripe fruit and vegetables in season. Some digest cocoa and chocolate well and profit by them. Those who have been accustomed to use wine and beer may often experience benefit from them, while some do well with extract of malt. Stout and porter have a great reputation for furthering the flow of milk, and agree with some patients. With others, however, they are not assimilated and serve to disturb digestion and injure the patient. The question is often asked whether substances containing acids should be taken by patients who are nursing a child. This will depend entirely upon the assimilative powers of the person. The fruit-acids found in ripe fruits and in some forms of vegetables, if taken in moderation, often do not disagree with the mother, but, on the contrary, promote her digestion. The use of a small amount of vinegar upon plain salad, with oil, need occasion no disturbance to the child if the salad is digested by the mother. It is the formation in the intestine of irritating acids from fermenting food which more often causes an irritating condition of the milk, than the consumption of moderate amounts of fruit-acids.

Where it is necessary to prescribe tonics for these patients arsenic will be found especially useful. This may be given in Fowler's solution, well diluted, beginning with one drop three times daily, and advancing to five and then returning to one. A bitter tonic, as gentian, may be combined with arsenic to advantage. Tincture of nux vomica may be used in small doses without disturbing the milk, and often serves as a useful tonic. Preparations of iron most easily assimilated by the patient will give the best results in the formation of milk.

Women are sometimes seen to fail absolutely in the formation of milk. There is no apparent reason for this anomaly, as many of these patients are robust and seem exceedingly well developed. In some of these cases there is an evident failure in the development of the nervous system governing the genital tract. Some of these patients have very deficient labor-pains and must be delivered by the use of forceps. In others gout or rheumatism lies at the basis of failure of secreting milk, while in others the age of the patient, if she be considerably beyond the usual period of childbearing, seems to be an important factor. In these cases a faithful effort must be made to stimulate the formation of milk by applying the child to the breast and by the use of the breast-pump, with massage. The child, however, must be fed in order that it may thrive, and that the mother may be relieved of the anxiety and disappointment which her failure occasions. If, however, at the end of five or six days no secretion of milk appears, the breasts remaining perfectly

flaccid, it is probable that failure of lactation is present. These patients sometimes show a corresponding slowness in the involution of the genital tract. The uterus becomes small more slowly than in women who nurse a child, and the recovery of the patient is somewhat delayed. Especial care must be taken in these cases by giving ergot and iron, by the use of douches, by massage, and, if necessary, by curetting, to secure proper involution. In other cases involution proceeds even more rapidly than normal, although lactation is not present. It is also true that the secretion of milk may partially or even entirely fail from a deranged condition of the nervous system. Thus, a young woman may begin to nurse her child successfully, and a cause of chronic nervous irritation, as some domestic trouble, may bring about a gradual and total failure of her milk. If the physician can recognize the complication present sufficiently early, he may begin to feed the child before the failure of milk actually occurs. In this way he will be in a measure prepared and forearmed against the mother's failure. It is of great importance in these cases to relieve the mother of the mental anxiety that she is not nourishing her child, and, if the child be partially fed, it is much easier to keep up her secretion of milk than if she feels that the child is entirely dependent upon her.

The nervous system has an important influence upon the secretion of milk, and hence anxiety and strain should be avoided if possible. If the patient is apprehensive, measures should be taken to allay her fears. In women of good constitution hope should not be given up that a reasonable secretion of milk will occur until a week has passed without the establishment of the flow. As soon as it is found that the child is not obtaining sufficient it should be fed at regular intervals, and allowed to nurse at times in proportion to the amount of milk present.

Cracked and fissured nipples and malformation of the nipples occasion great annoyance to nursing-women. Any wound or injury to the nipple exposes the patient to the danger of infection through such a lesion. Care should be taken to render the epithelial covering of the nipples in a healthy condition by suitable applications during pregnancy. These should be such substances as will tend to heal any slight abrasion and render the nipple soft and pliable. A very useful application is an ointment of cosmolin and lanolin, containing ten grains of powdered boric acid to the ounce. When it is found, however, upon the child's nursing that the nipple is sore, special precaution must be taken to avoid infection. The entire breasts should be thoroughly washed with soap and water and bichloride solution, 1 : 5000. The nipples should be cleansed with saturated solution of boric acid before and after each nursing, and also anointed with boric ointment. It is well to apply the breast-pump for a few moments before the child nurses, as the first coming of the milk through the nipple is often exceedingly painful. A nipple-shield may be used to advantage, and, if the milk be started with the pump, the child can often obtain its food without difficulty. The best nipple-shields are composed of a single glass bell to which is attached a rubber nipple, without a tube, and can usually be employed with great comfort to the patient. If scrupulous cleanliness be maintained and patience be exercised in the

use of the shield and pump, the majority of cases of fissured nipples will recover without abandoning the nursing of the child. In cases, however, where infection of the nipples results, an effort may be made by touching ulcerated surfaces with nitrate of silver to check the infection without abandoning the use of the breasts.

Engorgement of the milk-ducts (caked breasts) results from neglect properly to support and empty these organs. The lobules become distended with milk, usually upon the lower and outer portions of the glands. If these areas do not become infected, the patient may suffer inconvenience, but abscess will not form. The milk will be gradually absorbed and the patient will recover with but slight inconvenience. If, however, infection of these portions of the breasts occur, abscess is the result. When engorgement is present it should be relieved by a suitable bandage and gentle massage. The effect of rubbing is increased when a fatty substance is employed at the same time. Thus, sterile olive oil which has been warmed may be used to advantage. The rubbing should be from below upward, and should be followed by the application of a bandage.

Septic infection of the breasts may arise from germs contained in these organs before the birth of the child. It is possible in patients of bad habits for the nipples to become infected with gonorrhœal poison. In most cases, however, the breasts become infected through a wound of some sort inflicted by the mouth of the child, or through a fissure which develops during nursing. The source of septic infection may be the child's mouth in cases of gonorrhœa of the infant's mouth, or from the hands of the physician or nurse, or of the patient herself. The symptoms of septic mastitis are soreness, redness, and swelling in the nipple and in the areola just above the nipple. If infection is not arrested at this stage, it will spread into the lobules of the gland and abscess will form in one or more of the lobules. If the pus finds no outlet, it may open adjacent globules, honeycombing the breasts, may burrow beneath the glands in the fascia of the thorax, and may extend upward in the deep fascias of the axillæ. In these cases the breasts will be raised from the wall of the chest, while deep fluctuation can be obtained on thorough examination. The patient will have fever, with chills and sweating, rapid pulse, loss of strength and appetite, and the general symptoms of sepsis. The milk from the infected breasts will contain pus and bacteria.

The treatment of septic infection of the breasts consists in incision and drainage under antiseptic precautions. The breasts should be thoroughly cleansed with soap and water, rinsed with water, and then washed with bichloride solution, 1 : 2000. In cases where only the region about the nipple is infected, a short incision should be made over the point of fluctuation, and the pus allowed to escape. The infected pocket should then be thoroughly washed out with hydrogen peroxide and tamponed with iodoform-gauze, and a dressing of bichloride-gauze and cotton should be placed over the breasts, which are tightly bandaged. If infection has spread no deeper than the nipple and areola, the pain and swelling will subside and the pocket will speedily granulate.

In cases where a lobule of the breast has become infected and formed

an abscess, the location of the pus can be mapped out by deep fluctuation. The patient should be anæsthetized and the parts thoroughly cleansed, an incision should then be made parallel with the nipple, over the point of greatest fluctuation, and carried sufficiently deep to open the pocket thoroughly. The knife should not be turned transversely through the nipple, as milk-ducts may be severed by so doing. The abscess should then be thoroughly washed out, and the finger inserted and an effort made to discover other abscesses connected with the first. If the breast be found riddled by pus, a counter-opening should be made in the most dependent portion and a drainage-tube passed from above downward. Where, however, but a single cavity is found, it should be disinfected and packed with gauze. In neglected cases in which suppuration has persisted for some time it is well to curette the abscess-cavity before washing it out. The gauze tampon should be removed gradually, and the cavity be made to close from the bottom. Under good surgical care abscesses of the breast rapidly heal, and, if they be opened promptly, but little damage will be done to the secreting portions of the breasts.

Lactation must be checked, if possible, in septic breasts, and this can be accomplished by tight bandaging and by avoiding nursing and the use of the pump. In subsequent pregnancy the patient who has had mammary abscesses may experience trouble when the breasts fill with milk.

Especial precautions must be taken to avoid distention and fresh infection. If this be done, such patients will often escape annoyance and furnish a suitable secretion of milk.

Cases arise in which it is necessary to check the secretion of milk as rapidly as is consistent with the patient's safety. It must be remembered that the secretion will gradually cease if the breasts are not nursed or pumped. The breasts should be thoroughly cleansed, and covered with a light layer of aseptic cotton. A breast-binder should be applied as tightly as is comfortable. The patient may be given saline laxatives until the bowels move copiously, and her diet restricted in the matter of liquids.

If strict cleanliness has been observed, the patient will not have breast-abscess nor will she suffer serious consequences from distention. The breasts may become somewhat caked, but this will gradually disappear without injury to the patient. Various drugs have been tried in different ways to check the secretion of milk. Belladonna has been given to some advantage, although its utility is but limited. Where the patient suffers from overdistention the breasts may be very gently rubbed and sufficient milk only extracted to relieve the tension.

To relieve overdistended breasts the following preparations of belladonna have been employed: A solution of atropine, four grains to the ounce, has been applied to the breast by moistening a circular piece of surgeon's lint, three inches in diameter, and laying it upon the breast, retaining it in place with a bandage. Others have employed belladonna ointment of the Pharmacopœia, rubbing a portion of the ointment as large as an English walnut into the breast with massage. Others have given belladonna internally in the form of atropine, $\frac{1}{100}$ of a grain, two

to three times daily, or tincture of belladonna, 20 drops, three or four times daily. While many claim that this remedy has great efficiency, it is often impossible to say whether belladonna or other agencies employed at the same time have been efficient.

It is often of importance to ascertain the composition of breast-milk to determine its fitness for the food of the child. Its reaction should be alkaline; it should contain a considerable amount of cream; while upon microscopic examination bacteria should be absent. Milk-globules should be abundant, large and smooth in contour; the color of the milk should be a pearly-white. In cases where the milk contains too large a proportion of colostrum the colostrum-corpuscles will be present in abundance, while, if infection has occurred, bacteria and pus will be found.

In considering the influence of drugs upon a nursing-infant it must be remembered that drugs affect a child often in proportion to their solubility. Thus, the bromides, iodides, and chlorides very notably influence the composition of milk. Alkaloidal substances may also be absorbed in sufficient quantities to affect the nursing-child. Combinations of the metals less often influence the composition of breast-milk. Certain fruits and plants contain principles which influence the nursing-child. Thus, rhubarb given to the mother will purge a child, as will also colocynth or elaterium. Asparagus will sometimes affect the composition of the milk, while the pronounced vegetables in taste and odor, as onions and garlic, directly affect the odor and taste of milk. Mothers vary greatly in their susceptibility and that of their children to various drugs and substances, and each case is a matter for careful observation rather than for routine prescribing.

An excessive secretion of milk is sometimes observed, and is a troublesome complication. It is often seen in ill-nourished, anæmic women, in whom food taken seems to result more in the formation of milk than the making of the blood. Many of these women are of diminutive stature and very badly developed. An examination of these cases will usually reveal the fact that the blood of the patient exhibits the signs of anæmia. These women are often found to have been subjected to undue strain from labor, from exhausting illness before childbirth, and bad hygienic surroundings; from unfavorable climate or from a continued cause of nervous and mental depression. In dealing with these patients they must be carefully examined to determine any condition of anæmia or visceral disease which may be present. The treatment of anæmia must be thorough and vigorous, arsenic and iron being used with freedom. The child should also be partially fed, as a diminished demand from the mother is usually met by a diminished secretion. The breasts of the mother should be constantly compressed by a carefully fitted and snugly applied breast-binder, with supports over the shoulders. The mother's diet should contain as little liquid as is compatible with health, and gruels, cocoa, milk, sugar, and starches should be taken with great moderation. Some drugs have a reputation for lessening the supply of milk. Among these is belladonna, ergot in considerable doses, hydrate of chloral, the bromides, antipyrin, and iodide of potassium. All, however, are distinctly inferior to the methods of treatment already

described. Where a change of climate can be secured, taking the mother to the seashore or into the country, the result is often most satisfactory. If the condition of the uterus or pelvic floor demands it, any pathological condition found there must be corrected. Although this complication is often obstinate, it rarely fails to yield to intelligent treatment.

The duration of lactation is dependent upon various conditions. Should the mother become pregnant the secretion of milk will cease, although colostrum may remain in the breasts. Lactation may be suspended by anæmia, or any intercurrent disease which destroys the patient's strength.

Nature would seem to indicate that the child should nurse until it obtains sufficient teeth to enable it to begin a mixed diet. This would require that lactation should continue from a year to eighteen months after the birth of the child. As a rule, however, it may be said that healthy women may nurse a child to advantage, if placed in comfortable circumstances, from eight months to a year.

In cases where women are poorly developed and where the milk is scanty it is well to begin to feed partially from the beginning. The best food for this purpose is partially digested cow's milk and cream, fed to the child from a nursing-bottle. Such milk should be pancreatinized, and given to the child in quantities varying from one to two ounces every two hours. If the mother can but partially feed her infant, her milk should be reserved for nursing at night and morning.

SECTION V.

INFANCY IN HEALTH AND DISEASE.

CHAPTER I.

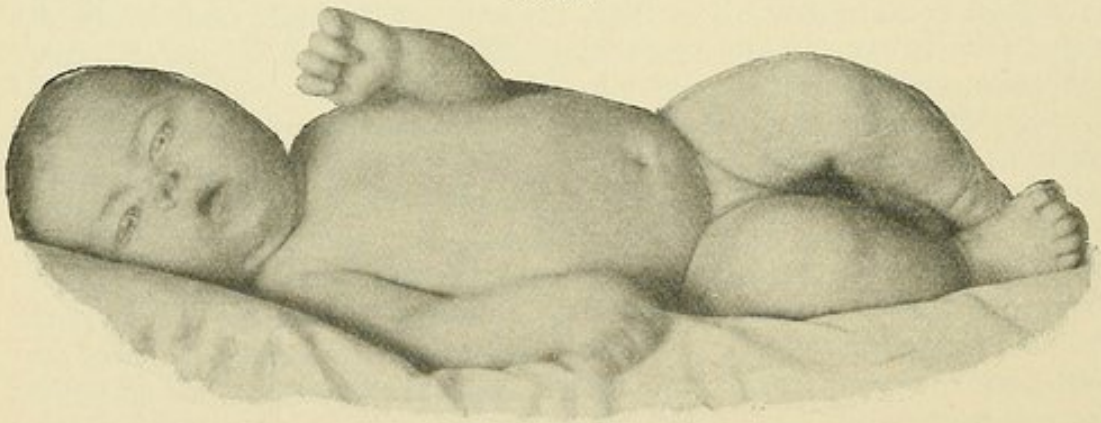
NORMAL INFANCY.

THE weight of the fœtus at term is from 6½ pounds for girls to 7½ pounds for boys. Children have been born weighing as much as twenty-two pounds, while at the other extreme of the scale children have lived who weighed but 2¾ pounds.

The circumstances determining the relative development of the fœtus are the size and stature of the parents, and especially that of the father. The general condition of the mother and her nutrition are also of great importance in determining that of the fœtus.

At birth the fully formed fœtus has certain definite proportions which are a valuable index in determining its maturity and normal growth. The length of the child is commonly estimated at 50 cm. If half this

FIG. 203.



Healthy infant.

length be taken and ten added to it, the sum (35 cm.) is the circumference of the chest. In the normal newborn child the greatest circumference of the skull exceeds that of the thorax by 2 cm. When this proportion is altered or reversed the fœtus is the subject of some vice of development, as is seen in the rhachitic or in hydrocephalus. The healthy infant loses weight for the first few days after birth, but by the end of the first week the loss of weight ceases and the child begins

to grow. This gain is in direct proportion to the quality of its food and the perfection of its assimilation. Usually several ounces are gained each week, and the rate of increase is a steady one for the first year of life.

It is important at times to diagnosticate the stage of development of a given fœtus. Medical and legal questions sometimes require an opinion regarding the maturity or non-maturity of a given child. It has been asserted that the size of the finger- and toe-nails, the ability of the child to open its eyes, the presence of hair upon the scalp and of the lanugo on the skin are important evidences that the child is at full term. While these points are essential in establishing viability, they are not proof that the infant is fully matured. A better proof that the child is fully grown is found in its weight and in its various dimensions. In the fully formed infant the accessory fontanelles are closed; the smaller fontanelle is nearly obliterated; the larger fontanelle is only sufficiently large to contain the thumb or largest finger; the eyes are fully opened and bright, and the child is able to nurse vigorously. In the male infant the testes are found descended into the scrotum. The fully formed child can cry lustily, while its functions of digestion and excretion are well performed.

If the child falls considerably below the normal weight and proportions, although it may live, it must be considered as an ill-developed child, although viable.

The first movement of infant life consists in the act of respiration. This may occur during or after birth, and is occasioned by pressure upon the umbilical cord, or by the occlusion of the placental sinuses and the cessation of pulsation in the bloodvessels of the cord. Respiratory acts which occur during birth are dangerous to the child, on account of its liability to inspire mucus or blood from the mother's genital tract, thus setting up inspiration-pneumonia. When respiration occurs outside the mother's body it marks a natural transference from life dependent upon the mother to a separate existence. As soon as the child is born, its mouth and nose having been cleaned, it should be laid upon its right side with its head slightly lower than its body. The cord should be taken in the fingers of the physician and its pulsations noted. As soon as this ceases or becomes faint the cord should be ligated in two places, and cut between the ligatures. If the child's mouth seems partially occluded, it should be held head downward for a few moments, when it will expel mucus or blood from the mouth and nose. A healthy infant will often cry lustily for a few moments after birth. Various explanations have been given for this cry, and it seems most reasonable to conclude that irritation of the skin, caused by the cooler air, creates an involuntary inspiration and expiration.

The changes in the infant's circulation which occur after the ligation of the cord, as well as the expansion of its lungs, take place very gradually. The blood gradually ceases to pass through the foramen ovale, while the bloodvessels from the umbilicus gradually close. The lungs are not fully unfolded and filled with blood for some time after the child is expelled. During this time the child's need for air is much less than afterward. The fear often expressed that an infant will

smother, because its head and face are covered with flannel thrown lightly over it, is unfounded. At birth the child's blood contains an excess of oxygen, sufficient to carry on its vital processes for some time, with but partial respiration.

It is a good practice to wrap the newborn child lightly in a warm but light woollen blanket, after thoroughly anointing it with sterile olive oil. The child may then be laid in a convenient place upon its right side until the time of its first bath. Bathing with soap and water must be considered as an unnatural process in infant life. No other animal but the human species subjects its young to the exposure of total immersion in water at so early a period.

There can be no question that weak infants are often seriously endangered by bathing, from the withdrawal of heat from the body and the depression which follows such a process. In order that an infant's bath may be safely given the child and its bather must be protected from draft. The bather must sit near a source of heat, of which the best is an open coal or wood fire, while the worst is the register from a furnace flue. In summer weather no external heat save that of the sun is usually needed, but drafts must be avoided during the bath, and on damp days an open wood fire is most beneficial. It is quite sufficient, for purposes of cleanliness, to bathe the infant without immersing it in a tub of water. To cleanse the child none but the finest substances should be employed, while two basins of water are required. The child's head and face are to be bathed with a separate sponge, from a separate basin from those employed for the remainder of its body. The reasons for this precaution are to avoid the transference of infectious matter to the child's eyes and mouth, or from the region of the umbilicus or genitals. The water to be employed should preferably have been boiled, and should be taken at a temperature of not less than 100° F. The bather should wear a large, soft, flannel apron, sufficiently capacious to furnish ample covering for the body of the child. The child's head and face should first be bathed, the eyes being carefully cleansed with boric-acid solution, small bits of old, soft, and sterile linen being used for this purpose. The mouth should also be cleansed in like manner, and the nostrils, if there be any discharge from them. None but the purest and mildest soap may be used for an infant, and the entire scalp should be thoroughly cleansed with soap and water. When the toilet of the face and head is completed, the washing of the body should be done with a separate sponge from a separate basin. The child should be rapidly but thoroughly washed and rubbed, especial care being taken to cleanse the genital region thoroughly. The child's body may be anointed with a simple, sterile fat to advantage, pure olive oil or cocoa-butter being useful.

Some prefer the use of various powders, of which powdered boric acid, powdered oxide of zinc, and talcum powder are most used.

The care of the infant's umbilicus is a matter of importance, because infection may enter at this point, and because hernia may form where the umbilicus is imperfectly healed. When the child is first bathed, the nurse or physician should carefully examine the cord to be sure that no bleeding is going on. Where an abundance of Wharton's jelly is present

the cord may be cut again above the ligature, and the cord squeezed out from the umbilicus between the thumb and finger; it should then be retied firmly and smoothly. The cord and the navel should be thoroughly cleansed with boric acid or bichloride solution, 1 : 5000, and the stump of cord freely powdered. An unirritating powder, such as salicylic acid, one part, and powdered starch, five parts, forms a useful combination for this purpose. The stump of cord should then be wrapped in borated cotton and laid upward, to the left of the umbilicus, and kept in place by a light binder. The cord gradually dries without suppuration and usually separates in from five to ten days. If scrupulous cleanliness be observed, germs will not gain access nor will inflammation occur about the umbilicus.

The clothing of the newborn infant is a matter of importance. The best baby-clothes are those which are of soft material, plainly and simply made, and so arranged that the child can be quickly and easily dressed. The abdominal binder may be of thin flannel, but is best when made from worsted, being knit without a seam. Its purpose is to keep the dressing upon the cord in place, and to prevent injury to the umbilicus by the movements of the child. Infants should wear woollen next to the skin throughout the entire year. The weight of these clothes must be changed in accordance with the temperature of the external air.

Next to the skin of the child should be worn a woollen undershirt, so arranged that its lower edge may be attached by buttons to a woollen slip or skirt. Over these a long, white slip may be placed, being put on over the woollen, and both being placed upon the child by the same manipulation. The child's diaper should be of soft absorptive material, which does not occasion inconvenient bulk between the limbs. It is very desirable that some diaper material be found which can be destroyed as soon as soiled. Until this is prepared, the child should have an abundance which should be washed and dried as soon as soiled. The practice of simply drying the child's diapers without washing them is always dirty.

The child's feet should be covered with knitted socks, while its shirt should have sleeves coming to the wrists. A well-dressed infant has the smallest number of articles required, of the finest texture and simplest pattern; but one pin should be used in the child's dress, and that is its diaper pin. Buttons and strings should be employed for fastening its clothing. In addition to this clothing, the child will need woollen wrappers and woollen robes to be used when it is taken through the halls of the house or out of doors. It will also require a suitable cap. Elaborate infant's wardrobes, composed of garments complex in pattern and heavily and expensively trimmed, are an annoyance to the child and an instance of bad taste on the part of the parents.

As soon as the mother has awakened from her first nap the child should be put to the breast. Before this, if the infant is restless and hungry, it should be given a teaspoonful of sterile water as often as desired. So simple a thing as first putting the child to the breast may be done properly, or in a way to cause annoyance and disappointment to mother and child. The breasts should be prepared by cleansing the

nipple with boric-acid solution, and by gently drawing it out with an antiseptic thumb and finger. The mother should then recline in such a posture that the nipple will fall naturally into the child's mouth, while the infant is held upon her arm. The first effort of the child to nurse may cause the mother considerable discomfort, but this will soon pass away. As the nipple becomes drawn out the secretion of milk increases. The child should be allowed to nurse at first as long as it will, and should be given the breasts in alternation. After nursing the nipple is to be cleansed and also the mouth of the child, and the child should be put quietly aside to sleep. A healthy newborn infant will pass the greater part of its time for the first days in sleeping, and this repose should not be interfered with by meddlesome relatives. The child will pass urine freely from the first hours of its life, and if the mother's breast contains colostrum, the bowels will move in the first eight or ten hours after delivery. The first urine of the child is almost colorless and abundant in quantity. The first bowel-movements are tarry, with an odor resembling burnt molasses. They resemble the juice of poppy in its crude state—meconium. They are composed of disintegrated blood-corpuscles, the hæmatin of which largely gives them their color of bile; epithelial cells and mucus from the intestines; they gradually become light as the secretion of milk is established until the stools are yellow, resembling boiled corn-meal. It must be remembered that the newborn child needs an abundance of water to flush out the kidneys and stimulate the action of the bowels. This should be given in teaspoonfuls as often as the child will take it. The child should nurse at regular intervals, and its daily life be established from the beginning with absolute regularity.

The nutrition and growth of the infant are profoundly influenced by other factors than food and sleep. After birth the child should be gently but thoroughly rubbed, and its muscles gradually developed by very light massage. If the hands of the nurse be anointed with olive oil or cocoa-butter, the skin of the infant will remain soft and uninjured. Although the eyes of the child cannot bear a bright light, still it should be kept in a well-lighted and sunny room. The light must not fall directly upon the child's face, but the influence of light upon growth is positive and should not be omitted.

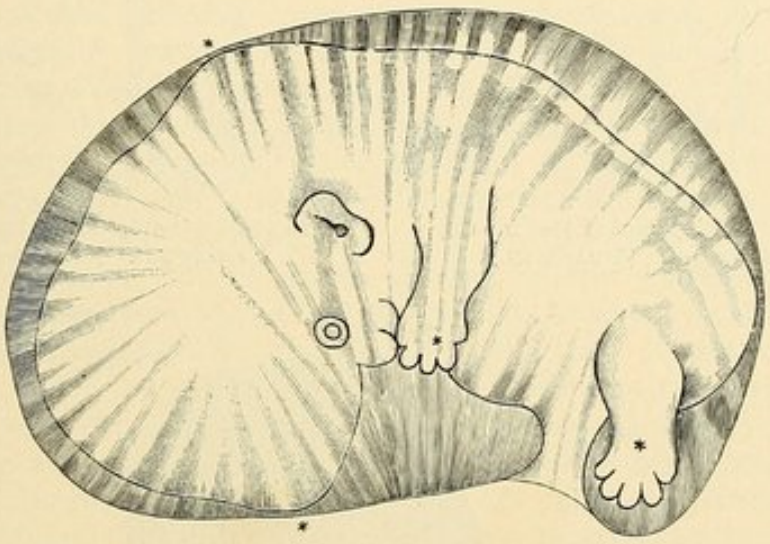
It should be remembered that the newborn child has an exceedingly sensitive nervous system, which receives a multitude of impressions from the world outside and is gradually developed by them. There is no evidence that the newborn infant possesses a mind or that it has mental consciousness of the world about it. It is, therefore, useless to receive its sounds or evidences of appetite as coming from an intelligent being. The development of the brain is a gradual process, and the relations of the child to life are of a purely animal nature. The newborn infant will be healthy and contented in proportion as it is treated as a growing animal. Its wants should be supplied with scrupulous regularity and cleanliness. If it be kept warm and comfortable and fed, it requires and cares for nothing more. It is folly to disturb it by making it a plaything for others or to ascribe to it intelligence which it does not possess.

CHAPTER II.

THE PATHOLOGY OF THE FŒTUS

THE child *in utero* is subjected to a considerable number of diseases, the relation and causes of which are not clearly understood. As the various layers of the ovum unfold some abnormality in these unfoldings may occur, resulting in false conformation and development. A not uncommon illustration is observed in the web fingers and toes which are often found at the terminal phalanges, while the child is otherwise perfectly developed. No history is obtained in most of these cases of accident or injury to the mother. The deformity may be partly corrected by cutting the fingers apart, taking care that the surfaces be healed completely before dressings are removed, to avoid repeated adhesions. Rudimentary finger-tips, if they are so imperfectly formed as

FIG. 204.

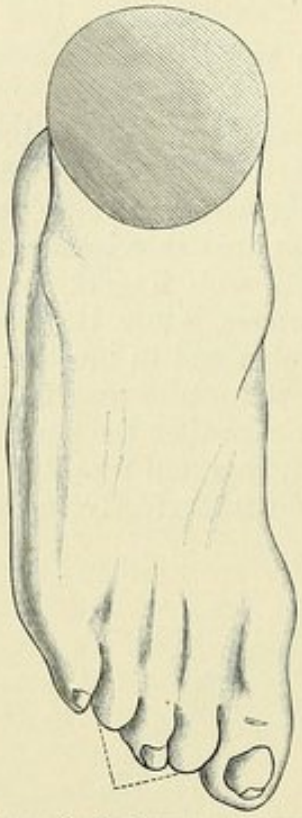


Deformity of fœtus from amniotic adhesions. Stars indicate points where such adherence is most frequent. (STRASSMAN.)

to be useless, may often be removed to advantage in these cases. The fœtus may suffer deformity in development from the addition of phalanges to the hands and feet. It is not uncommon to see children who have an additional thumb upon one or both hands, and as this extra digit is useless and impedes the use of the hand, it should be amputated. The occurrence of club-feet is ascribed by some to deficiency in the amniotic liquid, and by others to partial adhesion of the amnion. Its treatment belongs to orthopedic surgery. Harelip and cleft palate result from the failure of the intermaxillary bone to unite the two halves of the mouth. Where harelip is the only abnormality present it may be removed by a plastic operation. Where, however, the hard palate is extensively cleft the case is one of great difficulty.

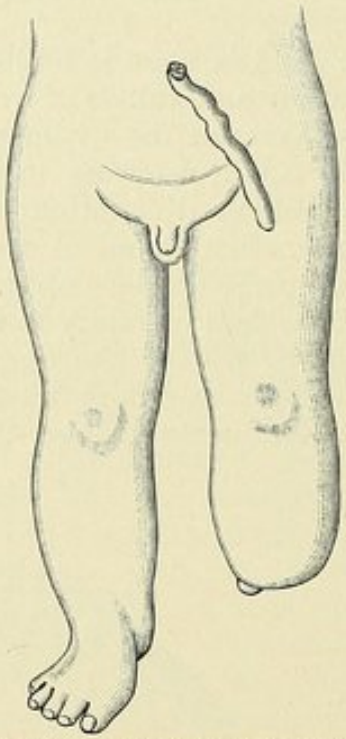
It is not uncommon for parents to notice that the child squints soon after birth. It does, not, however, follow that strabismus will become

FIG. 205.



Deficiency in development of toes from amniotic adhesions. (STRASSMAN.)

FIG. 206.



Intrauterine amputation by amniotic adhesions. (STRASSMAN.)

FIG. 207.

Supernumerary digits.

a fixed condition, as such children generally recover as general development proceeds.

In male children one or both of the testes may remain within the abdominal cavity, and this condition become a permanence. Phimosis is also a congenital abnormality which usually requires circumcision.

The only treatment of phimosis which gives permanent relief is that of circumcision. It is rarely possible in these cases, by efforts at dilatation, to lessen adhesions of the mucous membrane sufficiently to relieve the child permanently. It is well to examine the parts after birth and to endeavor to dilate the tissues sufficiently to secure a thorough cleansing, and, if possible, by gentle dilatation during the first month of life, to obviate the necessity of an operation. Unless, however, this is readily accomplished, circumcision is by far the better procedure.

If the child experiences no difficulty in passing urine, the operation may be delayed until a favorable time of the year, or until the child is eight months to a year or eighteen months of age. Symptoms, however, of irritation arising from this condition should be carefully sought for, and, if the child is fretful at night or experiences difficulty in emptying the bladder, delay should not be practised. The operation of circumcision in young children may often be performed without an anæsthetic, if the operator understands perfectly what he has to do. Careful antiseptic precautions are necessary, and if these be employed and hemorrhage does not occur, results are usually promptly satisfactory.

To perform the operation in young children, the operator requires a pair of scissors or forceps whose handles close accurately together. These are to serve as a shield, in order that in removing the foreskin no injury may be done to other parts. He also requires a sharp scalpel or a pair of sharp scissors, several hæmostatic forceps with fine points, fine sterile catgut or silk, and a few small curved needles, with needle-holder and dissecting-forceps. These instruments should be made thoroughly sterile, and in addition two sterile marine sponges, a roll of boric-acid gauze, and a T-bandage should be at hand. Anæsthesia is not to be employed. The child, having been properly cleansed, is to be laid upon a table and its body and limbs properly held by assistants. The operator then grasps the prepuce, drawing it gently down, and closing the handles of the scissors or forceps upon it to serve as a guard over the penis itself. This prevents any possible injury to the parts within. When this is accurately adjusted, the prepuce is removed by a quick cut along the outer border of the handles of the scissors or forceps. The tissues at once retract, and should be sponged with hot water and a sterile sponge. It will be found that while the external skin has been sufficiently removed, that the inner or mucous layer may remain unsevered and adherent. This must then be separated by the fingers of the operator, or by the blunt end of any convenient instrument; and if this separation is impossible, the tissue must be snipped or cut in the median line upon the anterior surface. When this tissue has been separated and drawn back bleeding is usually well under control. The parts should then be sponged freely with hot water, and made thoroughly clean. If bleeding points can be detected, they should be twisted by hæmostatic forceps. If hemorrhage

is not present, the mucous and cutaneous layers should be brought as closely together as possible, and the parts bandaged by winding a narrow strip of borated gauze about the tissues, from the opening of the urethra to the surface of the body of the penis. If this is applied evenly and snugly, there will be no congestion following. This should be held in place by a suitable form of T-bandage, and the dressing should not be disturbed for twenty-four or forty-eight hours after the operation. A child will usually urinate freely, and symptoms of irritation are often very greatly relieved. At the first dressing the most convenient way to remove the gauze is to remove the child's clothing from its waist down, and to place the child in a bowl or tub of warm water. The dressing will then soak off, and the tissue will usually be found agglutinated, but not perfectly healed. The parts should then be freely powdered with boric acid, and a second dressing of gauze applied as before. In three or four days, in uncomplicated cases, the parts are perfectly healed.

In excessively nervous children, where adhesions are tight and requiring careful separation, ether should be given. The plan of operation is the same as that indicated, with the exception of the fact that the mucous membrane must be divided upon the upper surface throughout its extent, and the adhesions very carefully separated. Under anæsthesia, the operator will do well to suture the edges of the mucous membrane and the skin by interrupted fine silk or catgut stitches.

If any abraded surfaces are left where adhesions were separated, they may be dressed by sponging with hot water, and then smearing with an ointment composed of ten grains of boracic acid and a half-ounce each of lanolin and cosmolin. This will prevent further adhesions. A dressing of gauze is then to be applied, so adjusted that the end of the urethra is unobscured. This dressing is to be renewed twenty-four to forty-eight hours after the operation, and the stitches can usually be taken out, unless catgut has been used, on the fourth or fifth day. The results of this operation, even in unfavorable cases, are usually exceedingly good. Occasionally persistent and dangerous hemorrhage follows circumcision. This occurs from wounding one of the small vessels, and usually where the operator does not employ hot sponging, or where he operates hastily and applies an ill-fitting dressing. In these cases the parts must be at once exposed, sponged with hot water, the bleeding points sought for and caught with hæmostatic forceps. They must be ligated, and compression exerted by a well-applied gauze bandage. Septic infection may occur if cleanliness is not observed. Should this happen, antiseptic douching of the parts with carbolic acid or boric acid must be employed, with prompt incision and drainage if abscess forms. Many cases of septic infection after circumcision prove very rapidly fatal.

Imperforate hymen may be present at infancy, but is a condition rarely detected until the time of menstruation. The fœtus *in utero* is not infrequently the subject of disease which affects and may seriously alter the conformation of its skeleton. Rhachitis is a common intrauterine disorder and produces the characteristic enlargement of the cranium and the enlargement of the epiphyses. It occurs in the children of rhachitic mothers, and may seriously complicate labor by reason

of the enlarged and firm condition of the fœtal skull. In deciding upon a method of delivery in a rhachitic woman, it must be remembered that her offspring generally inherits her disease, and that this must be taken into account in selecting the mode of delivery. Hydrocephalus is often associated with rhachitis.

The diagnosis of this condition is made by feeling with the fingers the smooth and round contour of the head, and observing that it is impossible to recognize the normal sutures and fontanelles. By palpation increased size of the head will be noticed, and its failure to descend into the pelvis. These cases are often associated with extensive failure of development in the child, so that its life would be impossible even if delivery were safely accomplished. In a case upon which the writer performed craniotomy the organs of the special senses were found imperfect in development, while the heart and bloodvessels were so abnormal that the infant could not have long survived. The feeble vitality and imperfect development of these children justify the obstetrician in conducting labor in these cases with reference to the interests of the mother only. The effort may be made to remove a portion of the fluid from the skull by introducing a trocar but a short distance, and allowing a portion of the fluid to escape. Although this procedure is successful in some cases, it cannot be relied upon in cases of extensive effusion for a favorable result.

Fluid may accumulate in other portions of the body, in the pleural or peritoneal cavity, a condition which occasionally complicates delivery. The fœtus may be affected by general dropsy, and the result of this condition may be such an increase in the size as to render the child virtually a monstrosity. The cause of this condition is disordered excretion in the fœtus, and the result is fatal usually before birth.

The fœtus may also develop tumors in various regions of the body. Thus goitre may become so large as to prevent entirely the flexion of the head and render delivery impossible. An ovarian tumor may develop and distend the abdomen, while sarcoma of the spleen may also be present.

Failure in the development of the vertebra and the meninges may result in a protrusion of the tissues surrounding the spinal cord, known as spina bifida. This is most common at the sacral region. Should the child survive and gain strength, these cases should be treated by operation, incising the sac, dissecting it out and bringing the tissues together to form a new wall. Meningocele is also observed in the cranial region, the protrusion occurring through one of the sutures. The plan of treatment suitable for these cases is essentially the same as that pursued in spina bifida. In addition to tumors which develop within the body of the fœtus proper, there may be adherent to the fœtal body the partially developed remains of a second fœtus. This is the result of twin conception, the second ovum having become blighted and developed but partially, although remaining adherent to the first. These parasitic embryos are usually attached to the base of the spine or at the back of the neck. It is sometimes possible to sever the connection, although in most cases the living fœtus must be sacrificed to secure delivery.

The acute infections which attack the mother may be transferred through the placenta to the child. Cases of intrauterine, fœtal tuberculosis are not uncommon, while syphilis, typhoid, malaria, pneumonia, and septic infection have been observed to pass from mother to child. The course and result of such infection usually correspond to the same in the mother. In the case of active infection the result is fatal to the fœtus. The treatment of these conditions consists in the vigorous employment of suitable remedies with the mother. Thus, if the mother has malaria, quinine should be given freely without fear of producing abortion. The child may also receive the benefits of the treatment given to the mother. Vaccination and inoculation of the mother with various antitoxins protect the fœtus as well as the mother.

The ovum may be the seat of apoplectic bleeding arising from various causes. If the mother has diseased bloodvessels, the vessels of the decidua will share in the condition, and rupture of these vessels may lead to an effusion of blood. If this be extensive enough to cause the death of the embryo, the ovum is known as a blighted ovum or uterine mole. This may be retained within the uterus for some time, such retention being known as missed abortion. Such an ovum will usually be expelled at a menstrual period and may be easily overlooked, because thought to be a large clot only. If, however, the blood-clot be soaked in cold water, the chorion can usually be recognized.

The skin of the fœtus is subject to abnormalities in development and in structure. One of the most striking of these is known as fœtal ichthyosis. In these cases the child is born covered with scales, the eyelids open and so stiff that they cannot close; the lips unable to shut perfectly; while the openings of the nostrils are so occluded that the entrance of air is impossible or difficult. If the child survives birth, this scaly covering goes away in patches, leaving a reddish surface, which soon develops a similarly hardened condition. Such a fœtus is without hair, has an elevated temperature, is unable to suck, is poorly nourished, and rarely survives its birth for a long time. No adequate cause is known for this condition, and no cure has been found for it.

The skin of the fœtus may be the seat of various eruptions occurring in the eruptive diseases of the mother.

Thus, measles and scarlatina have been observed in newborn children whose mothers were similarly afflicted. Smallpox and erysipelas have been observed in the fœtus, while a burn inflicted upon the mother usually produces, if severe, a corresponding red and sensitive area upon the fœtus.

Drugs given to the mother may produce chronic poisoning in the fœtus, as in the case of mercury in large doses or lead. Children born of women who work in tobacco factories during pregnancy often have a dark colored amniotic liquid and a dark and stained appearance of the skin.

The amniotic liquid may be excessive in amount or deficient in quantity. The first is styled polyhydramnios, the second oligohydramnios.

No single cause is known for the condition diagnosticated as polyhydramnios; a diagnosis is made by the excessive size of the abdomen and the exclusion of abdominal dropsy; the amount may reach gallons,

while the effect of such an excess upon the child is to render it puny and incapable of vigorous existence.

A deficient amount of amniotic liquid is sometimes observed, and may result in interference with the child's development through pressure of the womb upon the fœtus.

The placenta and membranes are often much discolored in cases of acute infection of the mother. Thus, in acute yellow atrophy of the liver, with profound infection of the blood, the membranes and placenta and amniotic liquid may be bright yellow. In other cases, where a purpuric condition develops, the appendages of the fœtus are dark and grumous in appearance.

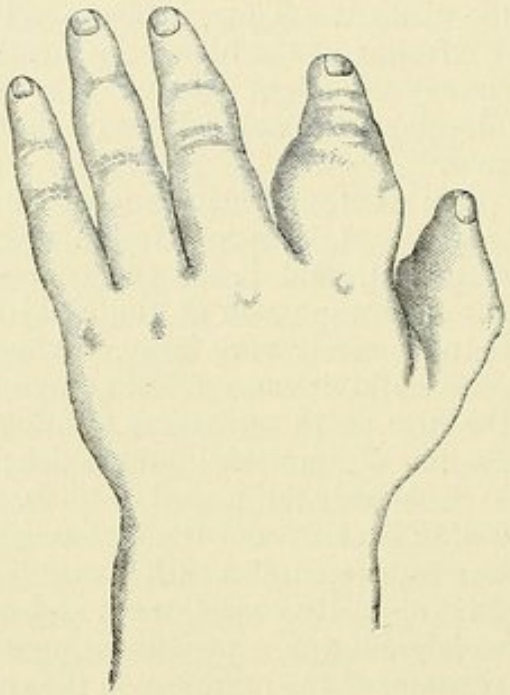
Polyhydramnios often excites premature labor through the abnormal pressure upon the uterus. It occasions feeble uterine contractions if the womb is overdistended, and hence the course of labor may be somewhat prolonged. The expulsion of the child is usually comparatively easy, as the fœtus is rarely very large. Abnormal presentations may occur because the child is more free to move than normally, and hence prolapse of the arm, with transverse position, can readily arise. In cases where the amount of amniotic liquid is deficient the effect upon labor is to prolong considerably the period of birth. The bag of waters is deficient and dilatation is slow, and the first stage of labor is unduly prolonged. Operative interference in such a case is more difficult than normal, and turning is especially complicated, and uterine rupture may threaten. The fœtus is more apt to perish during such a labor, if prolonged, because the pressure of the uterus upon the child is much greater than normal. Asphyxia from pressure upon the cord is not an infrequent complication. Malformation of the fœtus, with partial dislocation of its joints, has also resulted from this abnormality.

Fœtal syphilis is one of the most common and fatal of the conditions which affect the embryo and the child. The body of a fœtus the subject of this complication shows upon examination an enlarged liver and spleen, a partially macerated condition of the mucous and serous membranes, a deposit of fatty degenerated tissue about the extremities of the long bones, a catarrhal inflammation of the intestinal and nasal passages, with skin eruptions varying in appearance from roseola to patches of hemorrhagic condition, or of coppery discoloration. If infection is but recent, the child may be born with the appearance of good health, but within a few days a rise of temperature to 101° or 102° F. occurs, with a characteristic rash and chronic nasal catarrh; inability to digest; an earthy, ashen color of the tissues, while gradual failure of strength and death complete the picture. The appendages of the syphilitic fœtus give ample evidence of the pathological process. The maternal surface of the placenta is dark in color and contains abundant areas of grayish-yellow tissue, which is composed of infarcts at various stages of fatty degeneration. The membranes are grayish-yellow in many cases, the amniotic liquid is turbid, and the chorion especially is darker in color and more friable than in normal cases.

The degree of syphilitic infection and its course will depend naturally upon the virulence of the infection. Where both parents are syphilitic the embryo will rarely reach the stage of full-term development. Where,

however, the mother is healthy and remains unaffected, the child may be born with the appearance of health, developing the characteristic symptoms afterward. Where the mother is infected and the father is not, the child is undoubtedly syphilitic at the time of birth.

FIG. 208.

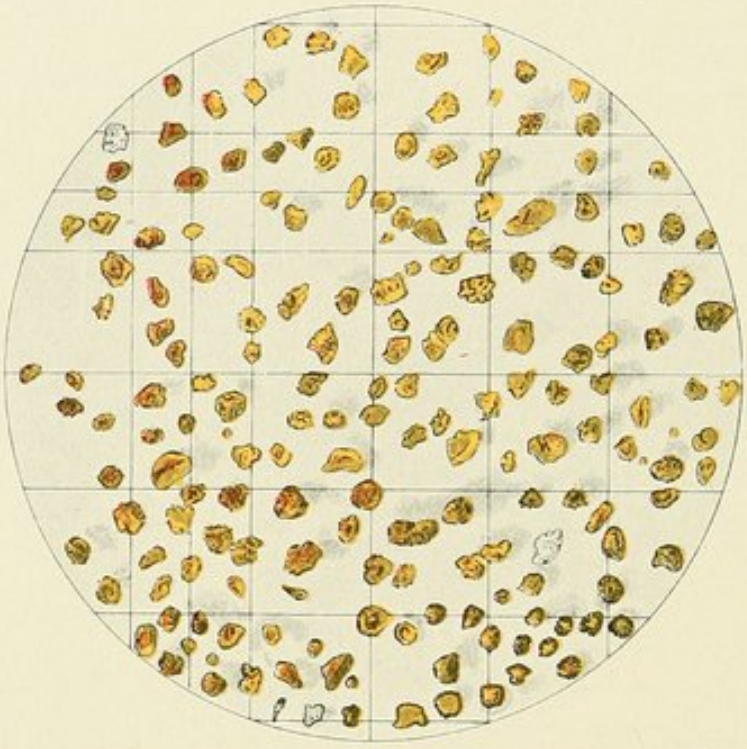


Syphilitic dactylitis. (SMITH.)

The treatment of this condition consists in the prompt use of mercury by inunction. A piece of mercurial ointment, the size of the nail of the little finger of the adult, may be rubbed into an axilla or one of the groins of the child daily. Excoriated surfaces should be dusted with boracic acid or boracic acid and iodoform. If the mother is apparently sound, the child may nurse unless its mouth is in a condition of ulceration or the mother's breast has sore nipples. Care should be taken to separate the child from the others if the patient is in a hospital, and scrupulous cleanliness and antiseptic precautions must be taken with its diapers and dressings. They should be washed in bichloride solution, 1 : 2000, after they are used. The anæmia from which these children suffer should be met by the ingestion of beef-juice, small doses of alcohol, and the administration of olive or cod-liver oil. Fowler's solution may be given, and is usually well borne. The use of mercury should be pushed to the point of constitutional symptoms, usually manifest in an indication of diarrhœa or excessive formation of saliva. Such a child should under no circumstances nurse another healthy woman, because of the danger of infection. It is quite possible for the infant to infect the breast of a woman, not its own mother, through the secretion of the mouth. The chronic nasal catarrh of such children is best treated by disinfecting the nares with weak carbolic acid, $\frac{1}{2}$ per cent., used in the form of spray or douche. While the mortality among these children is very high, a small proportion of them yield to treatment

PLATE XXVI.

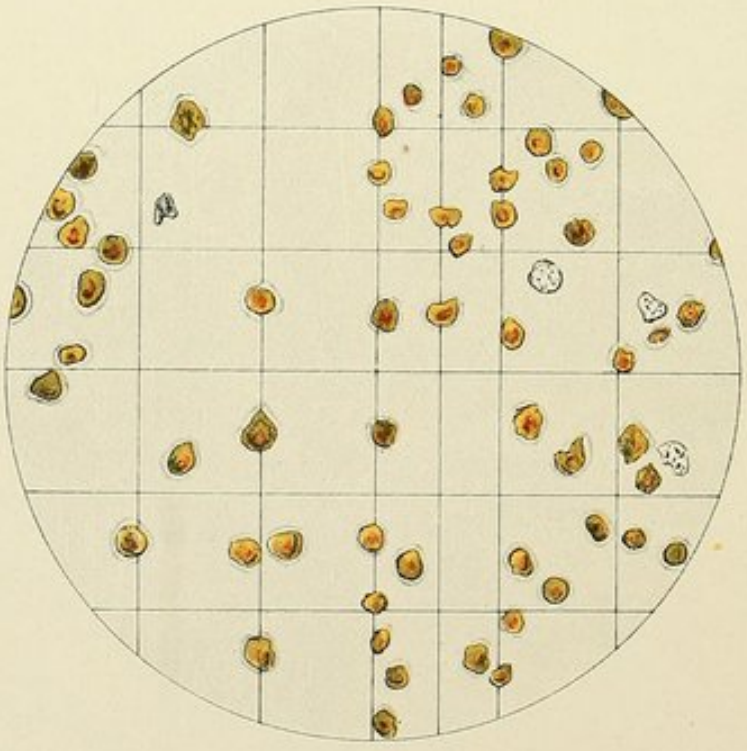
FIG. 1.



Blood of a Healthy Child One Month Old. Although Corpuscles show Crenation, Amount of Hæmoglobin is Normal.

Drawn from a Thoma-Zeiss Hæmocytometer
Obj. 1/6 Reichert. Count made by Dr. D. Braden Kyle. Drawn by Dr W. H. Wells.

FIG. 2.



Anæmia of the Newborn. Total number of Corpuscles reaches possibly Five Million, of which not over Two Million are Normal.

Drawn from a Thoma-Zeiss Hæmocytometer.
Obj. 1/6 Reichert. Blood-count made by Dr. D. Braden Kyle. Drawn by Dr. W. H. Wells.

if promptly applied, and seem to make a recovery. They are, however, rarely perfect in development, and seldom attain to the normal stature or vigor of a healthy child.

The appendages of the fœtus are also liable to pathological processes which may threaten fœtal life. While inflammation of the placenta is rare, this organ may become the seat of infection and also of the deposit of albuminous infarcts, which may diminish its vascular area sufficiently to asphyxiate the fœtus. These infarcts are seen in toxæmia of the mother and also in nephritis. The placenta is frequently found to possess considerable areas of fatty degeneration, yellowish in color and irregularly situated.

Calcareous deposits are not infrequent in the placenta, and have no established pathological significance. Extensive fatty degeneration with necrosis of tissue is found in syphilis of the placenta. The placenta and uterine decidua may contain diseased bloodvessels, the condition being that of arterio-sclerosis. Hemorrhage may occur from these brittle bloodvessels and can only be checked by direct pressure within the uterus.

The umbilical cord may be excessive or deficient in length. The first condition may seriously affect the fœtus by reason of knots or coils of the cord, which may cause such pressure as to shut off the blood-supply and cause asphyxia. The cord may be coiled around the neck, over the shoulder, and under the opposite axilla, or brought so tightly about a limb of the fœtus as to produce gradual amputation. When the cord is abnormally short the child may be asphyxiated in birth, and the placenta may be separated before the child is expelled. A considerable number of children are lost from asphyxia proceeding from coiling of the cord.

In rare cases it is possible to diagnosticate this condition by hearing a faint murmur through the abdomen, which is synchronous with the fœtal heart-sound.

The chorion may become the seat of degeneration, of the variety known as mucous myxœdema, the villi of the chorion gradually enlarging until they resemble grapes upon the stem. The embryo perishes, and the mass, when expelled, resembles a collection of small cysts or bladders. The amnion may be imperfectly developed, becoming adherent to the chorion and also to portions of the embryo. This process results in the formation of amniotic bands, which may produce malformation in the fœtus or often amputation of one of its parts. (Plate XXVI.)

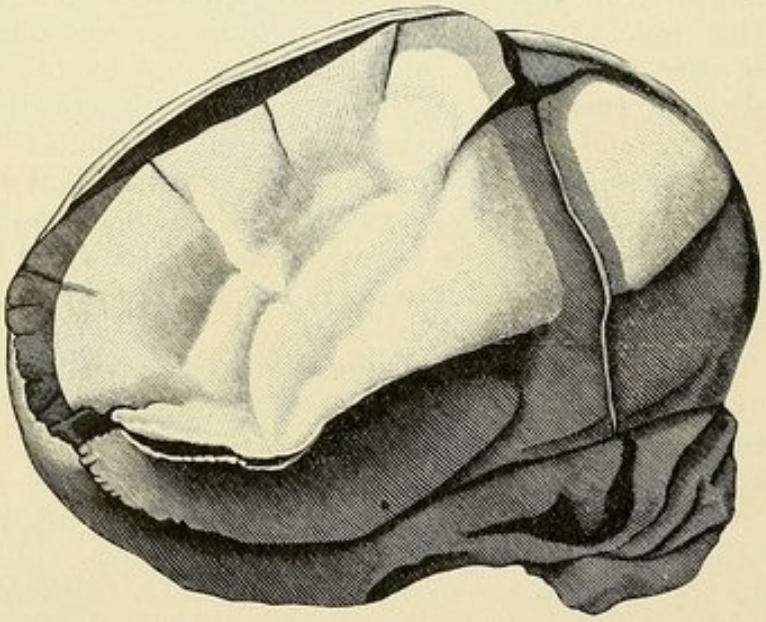
Fœtal blood is subject to the same diseases which may affect that of the mother. Anæmia in its various forms may affect the fœtus and proceed to a fatal issue.

CHAPTER III.

INJURY AT BIRTH.

THE process of parturition exposes the fœtus to dangers of mechanical injury. As long as the membranes remain unruptured the child is protected from injurious pressure by the amniotic liquid. When this, however, has escaped, the uterine muscle forces the child against the pelvis, and serious pressure may result. The fœtal skull will endure a considerable amount of force without injury as long as it is distributed over a large area. The elasticity of the bones and the arrangement of the sutures and fontanelles are such that, although the head may be pressed upon, it can endure considerable force without serious injury.

FIG. 209.



Forcible extraction by the breech. Child stillborn, with fractured skull. (ROSINSKI.)

When, however, the head is subjected to long-continued pressure upon a given area, the small bloodvessels of the brain in the corresponding portion become ruptured, and intracerebral hemorrhage results. The same effect is produced upon any of the large viscera of the body by long-continued pressure. Multiple extravasation of blood is observed in the liver, kidneys, spleen, lungs, peritoneum, and pleural membranes. If but little blood be thus lost, the infant may recover; but if a considerable amount has been expelled, the child will usually perish. (Plate XXVII.) Where the head is subjected to direct violence by the blade of the forceps or by the promontory of the sacrum the skull may be fractured and the bloodvessels of the meninges ruptured. The scalp may be severely bruised by pressure to such an extent that sloughing

FIG. 1.

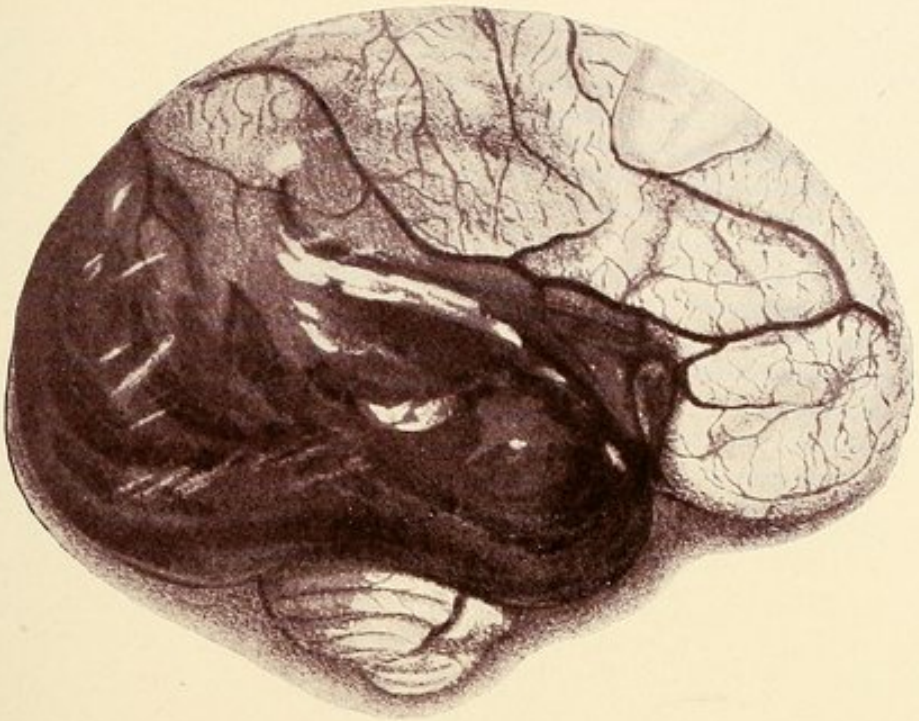


FIG. 2.

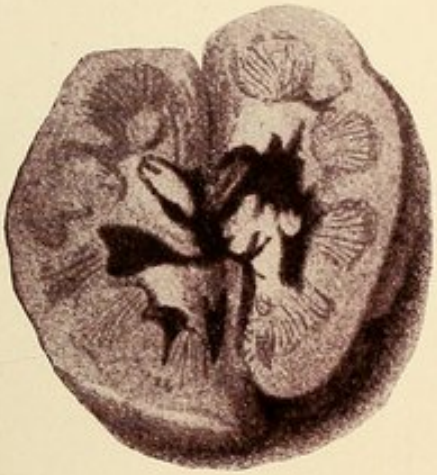


FIG. 3.

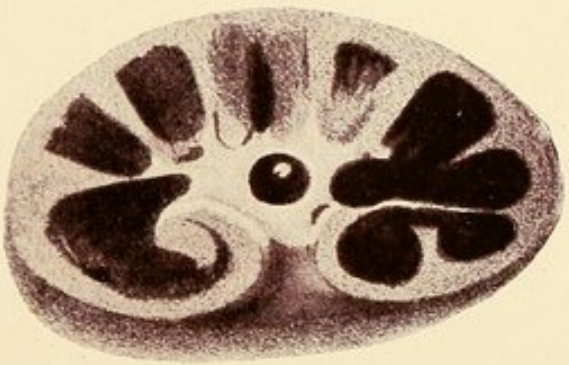
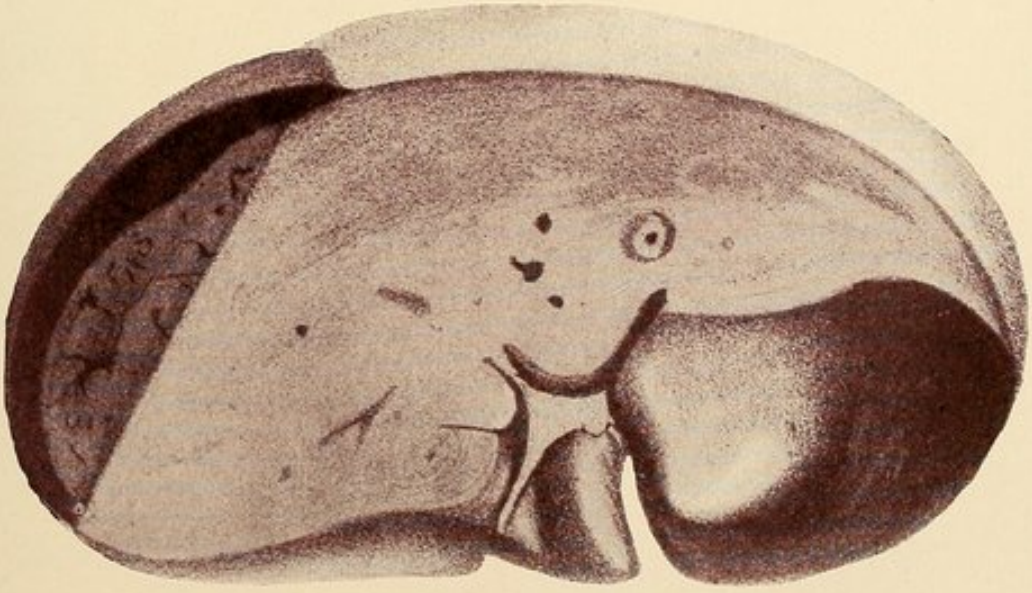


FIG. 4.



Visceral Hemorrhage from Pressure during Labor. (SPENCER.)

Fig. 1. Brain-clot. Fig. 2. Kidney. Fig. 3. Spleen. Fig. 4. Liver.

may follow. If the forehead be subjected to long and severe pressure, an effusion of blood may occur into the eyes. In cases where excessive violence is employed in delivery some of the viscera of the abdomen may be ruptured.

Avoidance of pressure upon the fœtus during birth is a matter of great practical importance. The effects of cerebral hemorrhage are felt in the future development of the child, and while life may be saved permanent injury to the brain may follow. It is of great importance that the physician should study his cases thoroughly to determine whether disproportion between the head and pelvis be sufficiently great to cause injurious pressure. It is better to subject the mother to delivery by surgical operation, if a living, healthy child be desired, than to allow her in prolonged labor to expel a fœtus fatally or permanently injured.

The operation of symphysiotomy is especially useful in protecting the life of the child in difficult labor. In well-selected cases the risk to the child is very little, and it is usually delivered promptly and with but slight complications. Infant deaths after symphysiotomy almost invariably arise from the fact that the operation is undertaken in cases where previous vigorous efforts have been made, sometimes for a considerable time, to deliver the mother with forceps.

In the management of labor the membranes should be preserved as long as possible. Their rupture to save time is never excusable. Care should also be taken to bring the head in favorable position to enter the pelvis, so that it may be only subjected to pressure at the pelvic brim for as short a time as possible. To accomplish this, care should be taken to bring the uterus with its long axis parallel to that of the pelvic brim, and this can best be done by the methods described in treating of the conduct of labor.

In assisting labor the physician will do well to omit the administration of ergot until the uterus is emptied. He will thus avoid subjecting the head to violent pressure through strong uterine contractions. The head, however, may be carried into the pelvis by suprapubic pressure, if the hands be applied to the sides of the head through the abdominal wall, or upon the occipital region. When the membranes have ruptured delivery should be secured as soon as possible. If labor ceases to progress, the forceps accurately applied to the sides of the head will prevent injury to the child. The instrument selected should possess blades properly curved to fit accurately and smoothly upon the child's head.

In case the skull has been subjected to severe pressure a distinct depression in the bones can be observed. If symptoms of compression of the brain develop, the physician would be justified, under antiseptic precautions, in incising the scalp and raising the depressed bone. Usually, however, dents and depressions in the head disappear spontaneously after a few days.

In cases of breech delivery where it is necessary to put the finger into the child's mouth to extract the head, the operator may wound the mucous membrane of the mouth by long finger-nails. If violence be used, the jaw may be broken. In performing such delivery it should be remembered that the finger in the mouth is simply to cause flexion,

and that the delivery of the head is to be completed by traction upon the shoulders and suprapubic pressure.

In cases where the descent of the breech is slow it may be necessary to hook the finger into the groin, thus making traction upon the body. If care be used in this procedure, no injury more severe than bruising of the skin will occur.

The most important of the injuries which will happen to the fœtus at birth is not accomplished by mechanical force alone, but results also from the conveyance of infection. The child will recover in a surprising way from a mechanical injury if no septic infection occur. If, however, infective matter is carried into the mouth through the dirty fingers of the physician, the results of a slight lesion may be serious. If a gonorrhœal discharge be present in the vagina at birth, the fœtus may be born with inflammation which may destroy sight or result in fatal pneumonia. Thorough antiseptic precautions, and cleansing the vagina in all suspected cases before delivery will greatly reduce fœtal mortality. (Plate XXVIII.)

Rupture of the umbilical cord rarely happens during labor. At the moment of birth, however, if labor be precipitate and the child fall from the mother, the cord may be torn across.

Rupture usually occurs several inches from the umbilicus, and bleeding is usually checked by the retraction of the vessels. The cord is occasionally cut and imperfectly tied, resulting in serious or fatal hemorrhage. In these cases the cut ends of the vessels do not retract, while the ligature does not successfully occlude the vessels above. An excessively thickened cord is often difficult to ligate, and hemorrhage may result in such cases. It is better in dealing with thickened cords to tie them temporarily, and after completing the labor to cut the cord freshly at the ligature, and strip it thoroughly from the umbilicus outward. It may then be retied with perfect control of bleeding.

In rare cases secondary hemorrhage from the cord results after ligature, and must be checked by passing two aseptic pins beneath the vessels at the umbilicus, and applying a figure-of-eight ligature about them.

The fœtus may sustain fracture of the long bones during delivery. These are rarely complete or compound. The treatment of these cases consists in the application of very soft splints, padded with cotton, and bandaged with cheesecloth or gauze bandages.

In cases of fracture of the long bones in infants a very useful splint is readily made by dipping pasteboard in hot water, thus softening it, and bandaging it upon the limb. When the pasteboard dries, it becomes sufficiently firm to hold the parts in good position. Especial care is required in these cases to avoid injurious pressure, as the tissues of the infant are easily injured by undue force.

The results of these fractures so treated are usually good, the patient recovering without noticeable deformity.

Injuries to the nervous system occurring at labor form an interesting field for investigation and study. Partial and complete paralysis may follow injury to the brain or severe contusion of large nerve-trunks. Injury to the cranium may be followed by thickening and adhesion of the membranes of the brain, and development of irritating foci which

PLATE XXVIII.

FIG. 1.

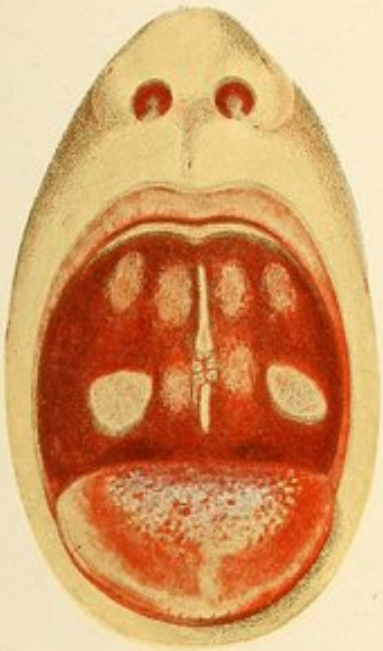


FIG. 2.

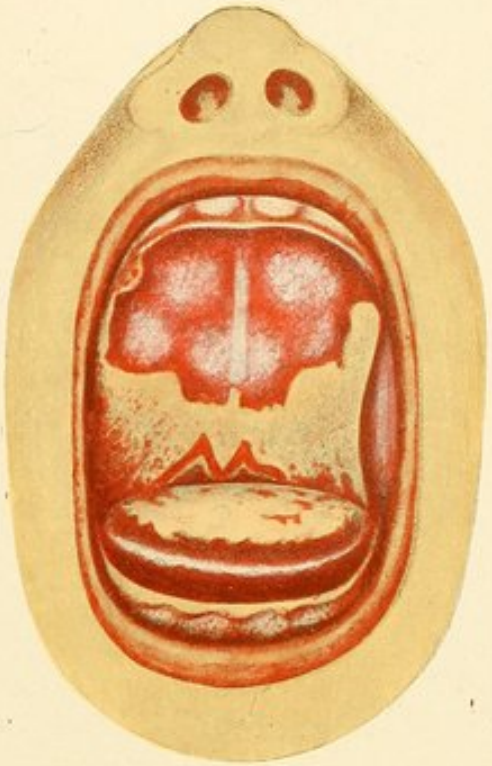
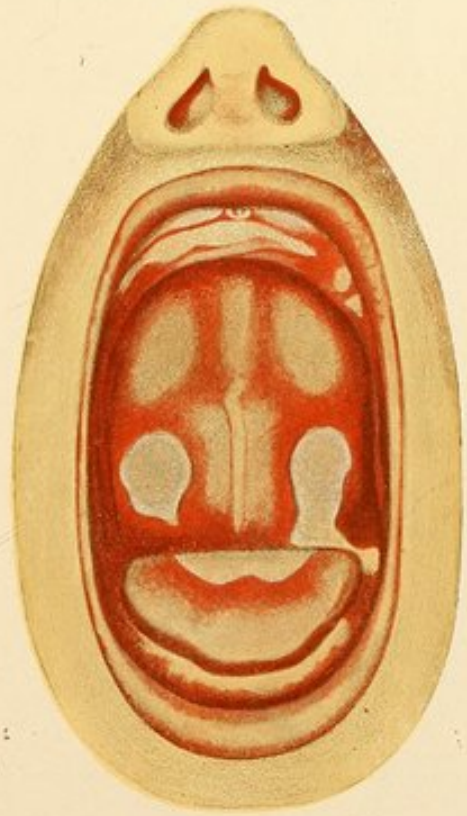


FIG. 3.

FIG. 4.



Gonorrhœa in the Mouth of Newborn Child. (ROSINSKI)

may produce convulsions. Permanent wasting of muscles, with permanent disability, may result from severe pressure upon the axillary plexus or upon single, large nerve-trunks.

FIG. 210.

Head bruised by forceps in case of deficient rotation; forceps could not be applied to sides of head. Child made good recovery.

In the treatment of these cases the first object must be to secure the best possible nutrition of the child.

Massage and electricity are of decided value in the further treatment of these children. A guarded prognosis must be given, in view of the possible occurrence of permanent muscular waste.

CHAPTER IV.

ASPHYXIA.

BY the term "asphyxia," when applied to adults, is understood a deprivation of the individual from his usual supply of oxygen needed to maintain life. The most familiar examples of asphyxia are afforded in the cases of drowning and poisoning by coal-gas. A patient may die from asphyxia from his own tissues, when the nervous system is so

paralyzed that respiration ceases. Such is the case in opium-poisoning. Again, mechanical compression of the windpipe or occlusion of the mouth will result in asphyxia.

The fœtus is liable to asphyxia while within the uterus and after birth. It will be remembered that, during intrauterine life, the placenta acts as does the gill of the fish, conveying oxygenated blood into contact with the fœtal circulation. It is evident that any cause which interferes with the mechanism of intrauterine circulation between the fœtus and mother will deprive the fœtus of oxygenated blood, and hence produce asphyxia. The process of birth affords excellent opportunity for such a complication, by reason of the pressure to which the child and its cord are then subjected.

When the child emerges into the atmosphere it is evident that occlusion of its respiratory passages, or paralysis of those muscles which perform the respiratory act, may bring about a condition of asphyxia.

Clinically speaking, asphyxia is commonly seen in two degrees—in one, the milder form, the child does not breathe, while its heart beats slowly and heavily, and the surface of the body is blue from the unoxygenated blood. Muscular contractility is present, and the child is readily brought to respire. In the more advanced stages of asphyxia, paralysis of the muscular system is present, the surface of the body is pallid, circulation is rapidly ceasing, while the child can be resuscitated only by prolonged and vigorous efforts. The first is sometimes known as asphyxia livida, the second as asphyxia pallida.

Asphyxia occurring before birth usually follows pressure upon the umbilical cord from coiling or twisting about the fœtal body. In cases where the cord is very short, occlusion may occur during the early stages of labor, and prove rapidly fatal. Separation of the placenta and hemorrhage also produce asphyxia, and are among its common causes. Disease of the placenta, which gradually alters its substance in such a manner as to destroy the lumen of its bloodvessels, gradually produces asphyxia. This is illustrated in nephritis and in arteriosclerosis of the mother, where considerable areas of the placenta are destroyed by a process of white infarction. Syphilis of the placenta may accomplish asphyxia, not only by altering the substance of the placenta, but also by loosening it from the uterine wall through fatty degeneration of the decidua and endometrium. Direct violence separates the placenta and may rupture the umbilical vein, causing hemorrhage and death from asphyxia. Chronic poisoning may lead to such changes in the placenta as to cause asphyxia also.

The course of intrauterine asphyxia cannot be understood without reference to the physiology of respiration, and especially to the part played in this phenomenon by the nervous system. The nervous centres of respiration are to be found in the medulla, apparently near the origin of the pneumogastric nerve. The accumulation in the blood of carbon dioxide acts as an irritant to the medulla, stimulating respiratory movements and also the inhibitory filaments of the pneumogastric nerve. When partial separation of the placenta occurs, or when the cord is so much occluded that but little oxygenated blood passes to the fœtus, the first effect is to cause respiratory move-

ments and to slow the action of the heart. This has been observed by experiment upon pregnant animals, and has been confirmed by clinical observation. In cases where the mother has suffered violence, if the fœtal heart be listened to, it will be found that, independent of the mother's shock and without the presence of labor-pains, if placental bleeding has occurred, the heart-sound of the fœtus will gradually become slower. If the placenta has been but partially separated, the child may rally, and its heart-beat gradually become normal in frequency and strength. It is interesting to observe that uterine contractions slow the fœtal heart-beat, undoubtedly by temporarily lessening the fœtal circulation and by temporarily depriving the fœtus of oxygenated blood. In practising auscultation the physician must remember this phenomenon, and avoid confusion through the presence of uterine contractions.

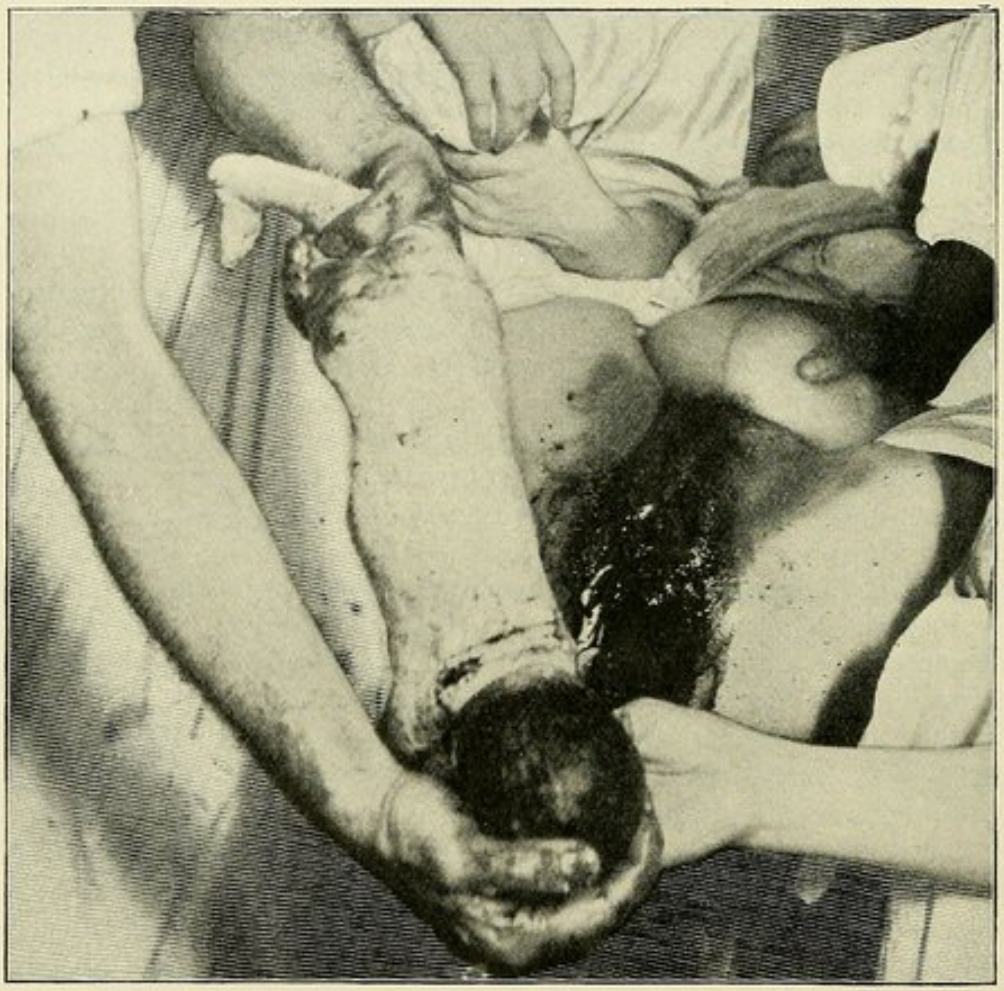
When the circulation of the fœtus is interfered with during labor, if air finds entrance to the genital tract, the respiratory movements of the fœtus may be accompanied by a faint sound known as a "intrauterine cry." This may also occur within the cervix or vagina during labor. The fœtus cannot make inspiratory efforts, if its mouth be not occluded, without inspiring some of the contents of the fœtal sac. If the membranes be unruptured, the fœtus will inspire amniotic liquid and the contents of that fluid. If the membranes have ruptured and if the child has descended into the cervix or vagina, it will inspire not only amniotic liquid, but also blood and the secretions from the cervix and vagina. If these tissues are the seat of infection, the fœtus will naturally inspire infective germs and their products by this process.

When the physician by auscultation has recognized the alteration in the fœtal heart characteristic of asphyxia his diagnosis will often be confirmed by the increased vigor and frequency of fœtal movements. These will resemble convulsions when this complication arises in vigorous children. The indications for treatment consist in terminating labor, and emptying the uterus as soon as possible in the interests of the fœtus and the mother. If the birth-canal be partially dilated, this should be carried to completion, and the child extracted as rapidly as possible by version or the use of forceps. Where dilatation is not advanced the os may be incised by four cuts with angular scissors, and thus rapid opening of the womb be secured. Delivery should be completed as soon as the womb has been opened in this manner. Where the hemorrhage which threatens is jeopardizing the life of the mother, if it cannot be checked by tampons, by the rupture of the membranes, and by external manipulation, it will be justifiable to incise the abdomen and deliver the child and control the hemorrhage at once. If done promptly, such a procedure will be successful.

Where the fœtus is threatened with asphyxia through pressure upon the prolapsed cord the replacement of the cord must be at once undertaken. This is best accomplished by carrying the operator's hand with the cord within the uterus, and placing the cord above the brim of the pelvis, and in such a position as to avoid pressure by the body of the child. If the conditions are favorable, labor may be terminated to advantage by version or by forceps. By placing the mother in a suitable

posture with the shoulders low and the hips elevated the fœtus may be in some cases relieved of dangerous pressure. In cases where the umbilical cord is wound about the fœtus delivery must be accomplished as soon as possible, and the cord hastily clamped between two hæmostatic forceps and promptly cut. It may be afterward ligated at the convenience of the physician.

FIG. 211.



Forceps delivery; asphyxia; cleansing the mouth while child is suspended.

Where the child is born in a condition of complete or partial asphyxia it should be at once suspended by the heels, while the physician takes the cord between his thumb and fingers to determine the presence or absence of pulsation. The attendant nurse should meantime thoroughly cleanse the mouth and nose of the child with the finger, covered by a bit of soft linen soaked in boric-acid solution and glycerin. If the cord be pulsating, haste is not imperative. By supporting the forehead of the child, the body being still suspended by the heels, the mouth will open, and mucus or other occluding substance will gravitate outward. As soon as the pulsation of the cord ceases it should be promptly tied, when the child will make respiratory movements. Should this not occur, the heart-beat of the child being strong but

slow and its surface suffused with blood, the cord should be allowed to bleed for a moment from its fœtal end. This will relieve a distended condition of the cavities of the heart, and will favor the establishment of the pulmonary circulation. Where, however, this is not necessary, and respiratory movements do not occur as soon as the mouth has been thoroughly cleansed, air should be forced into the chest, preferably by Schultze's method. This consists in grasping the child between the two hands of the physician, the thumbs being placed upon the chest, the index-fingers in the axillæ, and the remaining fingers obliquely across the back. The head of the child should be thrown backward, being supported between the wide portions of the hands just above the thumbs. The child should then be raised and turned so that it will double upon itself, its feet and back coming toward the physician. It is then swung downward and outward, its lower extremities and abdomen falling downward toward the floor. By this manœuvre, when the child is swung toward the physician and doubled upon itself, the abdominal viscera are forced upward against the diaphragm, the chest is compressed, and a powerful expiratory action is obtained. When the child is swung outward and downward the abdominal viscera fall away from the diaphragm, and a vigorous inspiratory action follows. There is abundant evidence to show that unless the mouth and trachea are completely occluded, air can be forced into the lungs by this expedient.

It must be remembered that no manipulation for the relief of asphyxia can long be continued without danger that the child will lose heat and suffer from shock. After swinging the child several times it should be placed in a hot bath upon its back, the surface of the chest just below the water, and its tongue be drawn out, while the surface of the body is rubbed vigorously with the hand. If respiratory movements still fail, the child's body should be raised until the chest is above the water, and a spray or fine jet of cold water be directed against the region of the diaphragm. If the child's circulation is good, these procedures will usually establish respiration without difficulty.

If, when the child is born, the cord is not pulsating, no time can be lost in delay, but the cord must be immediately cut and tied. The child should be held head downward while the mouth is thoroughly emptied and cleansed. Schultze's method should then be followed for a few moments until air has been forced into the chest. The child should then be placed in the warm bath, and Sylvester's method of respiration be practised, while the tongue is drawn outward and forward. This consists in drawing the child's arms upward and outward, and then depressing them and bringing them across the chest. By this manœuvre the chest-walls are made to perform their part in respiration, while pressure upon the diaphragm is made when the arms are brought forward, or may be aided by pressure exerted directly upon the upper portion of the abdomen. Cold water may be sprinkled or sprayed upon the child's chest, and, if its circulation be feeble, it may be given ether or strychnine by hypodermatic injection. If the circulation of the child is feeble, mustard should be added to the hot water and the child's limbs and back be vigorously rubbed. By keeping the child

in the warm bath its circulation will be stimulated, and as long as its heart-beat and color improve there is hope for its recovery.

In cases where assistance is not at hand and the care of the mother and child is in the hands of one person only, a simple and effective method of resuscitating a child is obtained by grasping the child at its shoulders and buttocks, the surface of the chest being anterior and the child lying upon its back in the two hands of the operator. The head of the child should be lower than its body. The infant is then doubled up by bringing its head and knees toward each other, and in this manner the diaphragm is forced upward and expiratory movement is promoted. The body of the infant is then bent gently in the opposite direction, the arms being allowed to fall over the head, when the diaphragm descends and inspiration is favored. If the child's head be kept considerably lower than its body, and this simple manipulation be kept up for fifteen to twenty times a minute, children will often breathe who might be lost if this simple effort were not made. It is essential that the manipulation be gentle and done as nearly as possible at regular times, and that the head be kept lower than the body. After a few minutes more in this way the child should be laid in the hot bath and gently rubbed to maintain its circulation. It will often be found that the child will breathe when placed in the bath.

In cases where an abundance of mucus is found in the child's throat, and where it is evident that it has not been entirely removed by suspension and by swinging, a suitable catheter may be introduced within the trachea and aspiration of the bronchial tubes performed. A catheter to which is attached a hollow rubber ball is often used for this purpose, and is termed a balloon-catheter. If such be not at hand, the physician may aspirate the bronchi by suction, and, when the child's lungs have been partially freed by this procedure, he may inflate them by blowing air into the bronchial tubes. This method, however, is less easy of accomplishment and less successful in the majority of cases than suspension, swinging, the use of the hot bath, and prolonged passive respiratory movements. The child's reflexes may be stimulated by dipping the finger in whiskey or brandy and placing it within the child's mouth. This will sometimes cause movements of deglutition and respiration. Favorable symptoms in asphyxiated infants are the maintenance of the heart-beat, the improvement in color, and gradual establishment of respiration. When, however, the heart cannot be made to beat, the color remains pallid, the child's body is completely flaccid, and its bodily temperature diminishes, it is evident that the case is hopeless.

A child may be partially asphyxiated and recover very slowly. Observation has shown that the infant's lungs are not completely inflated for several days after birth. When respiration is once established, these patients must be kept at a temperature of not less than 99° F. and their respiration carefully watched. Stimulants must be administered as the condition of the heart and the breathing indicate. Should respiration fail passive respiratory movements must be instituted and kept up as long as needed. The use of the faradic current, one pole over the medulla and the other over the diaphragm, is of

value in these cases. Rhythmical traction upon the tongue is indicated in cases where the breathing shows a tendency to become shallow and to cease.

Asphyxiated children are exposed to pneumonia by the inspiration of the contents of the birth-canal, and the exposure to which they are necessarily subjected during efforts to establish respiration. Inspiration-pneumonia, if it affects a considerable portion of the lungs, is generally fatal.

A striking symptom of inspiration-pneumonia, occurring in infants after prolonged and difficult labor, is rapid respiration immediately after birth. The respiratory rate may rise to 50, 60, or 70 in the minute. The pulse is correspondingly quick, although not so fast in proportion as the respiration. The temperature of the child is elevated to 101° or 102° F., the child is restless, and nurses poorly. The meconium is slow in passing away from the intestine, and the action of the kidneys is often delayed. On auscultation the child's breathing is excessively harsh, but râles can rarely be detected. The action of the heart and the rapid respiration are especially noticeable in these cases. Unless a marked improvement occurs in the first twenty-four hours after birth, the child usually fails and dies comatose.

The treatment of this condition is often unavailing. The child should be held head downward as soon as born, and should be put in this position at frequent intervals for the first five or six hours after birth. In this way inspired and infectious material will sometimes be expelled. The use of stimulants is indicated, brandy being given in two or three-drop doses at frequent intervals. Gentle counter-irritation over the chest may well be employed by a warm mustard-bath, or by wrapping the child's chest in flannel wrung out of tepid water and sprinkled with spirit of turpentine. If the child nurses poorly, it may be fed by pumping the breast-milk from the mother and dropping it into the child's mouth, or by passing a small, soft catheter connected with a funnel into the stomach. The majority of cases, however, of this complication end fatally, and are but little influenced by treatment.

Cerebral hemorrhage causes death in some cases of asphyxia. This may arise from pressure upon the cranium during birth, or from cerebral congestion.

CHAPTER V.

THE DISEASES OF EARLY INFANCY.

THE diseases of early infancy may be conveniently divided into those which are infectious, and those in which no infectious agent can be found. Among the first, most common and important is septic infection. This may enter the body of the infant through any solution of continuity in

its tissues, and is usually found in the umbilicus, in the mouth, nostrils, or eyes. Umbilical sepsis is caused by lack of proper antiseptic precautions, with direct contact of septic fingers, dressings, or instruments with the stump of the umbilical cord. The symptoms of this complication are in many cases the formation of pus at the umbilicus, a red and angry appearance of the tissues, which easily bleed, redness and swelling of the skin adjacent, with fever, rapid pulse, and symptoms of septic intoxication. In other cases no local appearances are present, the umbilicus being apparently clean and no induration existing in the tissues, about. In these cases the constitutional symptoms are those of septic intoxication without inflammatory reaction. Upon post-mortem examination of these infants the vessels leading from the umbilicus are the seat of thrombosis and embolism, while micrococci swarm in these vessels, in the lymphatics, and tissues surrounding them. If life has persisted for some time after the infection, multiple abscesses may be found in the liver, spleen, and lymphatics of the abdomen. In other cases the only local sign which can be discovered is a dark and fluid appearance of the blood, without gross evidence of inflammation.

In recognizing umbilical sepsis attention must be drawn to the constitutional symptoms, and a diagnosis may be made rather from these than from local appearances alone. The child is peculiarly apathetic, loses appetite, is sometimes restless and again stupid, with rapid pulse and progressive failure of strength.

The treatment of this condition is primarily prophylactic. Many devices have been employed for thoroughly antisepticizing the umbilical stump and thus preventing infection. The cord has been cut short and the stump seared with cautery. Antiseptic ligatures have been employed, the cord stripped, again ligated, and enveloped in an antiseptic powder with an antiseptic dressing. The physician will often find among ignorant persons an interesting recognition of the value of a sterile dressing in the use of a charred rag. It is customary with some to wrap the stump of the cord in old linen which has been charred before the fire. It has been found, however, that the avoidance of umbilical infection depends more upon the strict practice of antisepsis by those who attend the patient, than by any given procedure in dealing with the cord. If the cord is stripped and ligated with aseptic hands, the ligature-material being antiseptic silk or linen thread, it is sufficient to envelop the stump in a sterile powder and wrap it in antiseptic cotton. Powdered boric acid, salicylic acid, one part, and starch, five parts, oxide of zinc or iodoform, are useful in dressing the cord. Borated cotton or simple sterile cotton is sufficient to serve as a dressing. Antiseptic gauze may be employed, although bichloride of mercury should be avoided as a rule in the surgical dressings of infants. The cord should be bandaged upon the right side of the child's abdomen, being held in position by a clean abdominal binder. The stump must be dressed daily and the soiled dressing burned. If these precautions are taken, umbilical sepsis rarely develops.

When, however, the infection has occurred, but little can be done to check its progress. It is well to destroy any septic matter in the umbilicus itself by touching it with a strong solution of carbolic acid,

followed by dusting with boric acid or iodoform. The further treatment of the case consists in stimulation and careful feeding.

The mortality of umbilical infection is very high. As reported from various large clinics, fully nine-tenths of children affected perish.

Next to the umbilicus the conjunctiva of the newborn is most often the seat of septic poisoning. This results usually from the presence of streptococci which accompany the germs of gonorrhœa. The poison is contracted by contact with germs present in the birth-canal of the mother during labor. Occasionally, the infected finger of a nurse or physician may convey the poison.

The symptoms of septic infection of the eyes, commonly called **ophthalmia neonatorum**, are redness, swelling and local heat, speedily followed by the formation of pus. The discharge accumulates at the edges of the lids, so that the lids become agglutinated unless the eyes are frequently cleansed. The lids become thickened and swollen, so that the eyes may be completely closed. If the malady is not checked or if the child is weak and depressed, necrosis of the cornea will occur, followed by perforation. In robust children the tissues may resist for some time, and while the lids remain slightly swollen, the cornea may escape serious injury. The discharge from the eyes in these cases is virulent and actively contagious, and may destroy the sight of others should contagion occur.

The treatment of ophthalmia neonatorum consists, first, in disinfecting the vagina as thoroughly as possible before labor in cases where a vaginal discharge indicates the possibility of contagion. Antiseptic precautions during labor are further indicated. As soon as the child is born its eyes should be cleansed in boric-acid solution, and one drop of nitrate of silver, 20 grains to the ounce, should be dropped into the eye, to be immediately followed by gentle irrigation with a normal saline solution. This familiar method of Crédé is universally recognized as of great value in these cases. Should evidence of infection again appear, the most assiduous care is required to check its progress. The eyes must be thoroughly cleansed at frequent intervals, but in the most gentle manner possible. This is best accomplished by inserting in the tube of a fountain-syringe a small glass pipette drawn to a fine point. Bichloride of mercury solution, 1 : 8000, or saturated boric-acid solution should be employed. If but one eye is affected, the other should be covered with antiseptic cotton held in place by a bandage. The child should be laid upon the lap of the nurse or attendant, who has a rubber apron, the end of which is placed in a suitable receptacle. The head of the child is turned in such a position that the eye to be douched is lower than the other. A gentle stream of antiseptic fluid is then allowed to irrigate the eye, flowing outward between the lids, the pipette being directed toward the inner canthus of the eye. The stream will thus flow downward and outward, avoiding the other eye. Great care should be taken to avoid rubbing or scratching the epithelium of the part. For this reason antiseptic irrigation is especially valuable in these cases. The nurse may separate the lids with the thumb and fingers, thus allowing the fluid thoroughly to flush out the eye. When this has been accomplished the eye should be gently dried with antiseptic cotton.

In cases of children in good condition, where the inflammatory reaction is violent, the use of cold is indicated. A large number of small bits of soft material which has been thoroughly boiled should be laid upon ice, and when thoroughly cold placed upon the eyelids. In cases, however, of feeble children whose nutrition is very deficient, applications should be made of soft material wrung out of hot water. It is prudent to dilate the pupils in these cases as soon as the inflammation becomes active. The use of nitrate of silver with these infants must be confined to the physician. The lids may be everted and pencilled with a silver solution, 10 grains to the ounce, followed by irrigation. It is sometimes necessary to drop the same solution between the lids, following it by saline irrigation.

Success in treating these cases will depend, not so much upon the antiseptic employed, as upon the frequency and regularity with which it is used. In cases which are taken promptly the eyes should be douched every hour during the entire twenty-four. Cold or hot applications must be constantly applied. In using silver solutions great care must be taken to avoid injuring the conjunctival epithelium. The eyes should never be rubbed, and should oozing of blood occur it is usually an indication that too strong an antiseptic solution has been employed.

The prognosis in these cases depends upon the promptness and vigor of the treatment employed and also upon the condition of the child's tissues. In vigorous children cases seen early will usually recover.

Systemic infection. Septic infection may also enter the body through the mouth. These cases are observed, as has been stated, where the birth-canal was not disinfected and where septic germs had been present for some time in the tissues. This material finds its way into the lungs in many cases through the respiratory efforts of the asphyxiated child. Broncho-pneumonia is the usual result in many patients, proving rapidly fatal.

The symptoms of this condition are those of pneumonia complicated by the depressing effects of septic poisoning. Vigorous stimulation with counter-irritation may support the patient and tend to prevent severe congestion.

The prognosis in these cases is grave in proportion to the child's general condition, and the amount of septic matter which it has inspired. Beyond the use of stimulants with suitable feeding, but little can be done for these cases.

The newborn infant is liable to several forms of infection of the blood whose pathology is not at present clear. The source from which the infection comes is thought by some to have been found in infected water in which the child bathed.

Cases in which the blood of the infant becomes infected often occur in the absence of an epidemic, or even of isolated cases of puerperal septic infection in maternity-wards. Thus, several infants may be similarly affected and die, while every mother remains with normal temperature and makes speedy recovery. In some of these cases the mother has had a foul vaginal discharge during pregnancy, probably associated with gonorrhœa or syphilis. In others no such condition has

been at hand. The most rational explanation of the occurrence of these cases in many of the patients is that a septic infection during pregnancy has occurred, which has been transmitted to the infant, but which the mother has successfully resisted. This in the case of women having foul vaginal discharges during pregnancy would seem a rational inference.

All of these infections have as their predominant symptom disintegration of the blood-corpuscles, a dark and fluid appearance of the blood, with multiple hemorrhages into the connective tissues. The urine is highly colored, and is found to contain hæmoglobin and hæmatin. The nervous system is profoundly affected, and coma supervenes. Among these affections are those described as Winckel's disease, Buhl's disease, melæna neonatorum, and malignant jaundice. Various attempts have been made to isolate the infective germ, but without positive success. In cases observed by the writer bacilli were isolated which produced the same disease in guinea-pigs. These bacilli, however, could not be identified. These cases are rarely single, but develop in groups. In those who recover the hemorrhages grow gradually less, the urine becomes clear, the child takes nourishment, and the depressed condition of the nervous system gradually disappears.

But little can be done in treating these cases. The inhalation of oxygen, the administration of arsenic in small doses, with stimulation, seem to give the best promise of success.

Tuberculous infection. The newborn infant is also exposed to infection from the milk of a diseased mother. It has been found by observation that micrococci are sometimes obtained in the breast before labor. These may be taken by the child, even though no signs of septic infection are apparent about the nipple. Tubercle-bacilli readily pass from mother to child. The course and symptoms of infection acquired in this manner are so gradual and masked that a diagnosis is often impossible in the beginning of the case. Later on, septic enteritis, with symptoms of ptomaïne-intoxication, may make a diagnosis evident. But little can be done in treating these patients. The intestinal tract should be thoroughly emptied, preferably by irrigation. The patient's strength must be supported in every way. While with many patients the prognosis is hopeless, still others may occasionally survive and gradually regain health.

Infants may be infected by tubercle from the milk of a tuberculous mother. In these patients the breasts of the mother show thickening and hardening of the tissues, while a positive diagnosis is readily made by subjecting the milk to microscopical and bacteriological examination. The symptoms in these cases in the children are fever, diarrhœa, distention of the abdomen, emaciation, thirst, and, finally, the extension of the infection to the lungs or to the meninges of the brain. The treatment consists in at once removing the child from its mother's breast, and substituting artificial food for the mother's milk. Cod-liver oil and creosote in small doses, one-fourth of a drop three or four times daily, well diluted, offer the best results in the way of treatment. Oil may be used by inunctions, olive oil being especially useful in these cases. The mouth of the infant should be examined for tuberculous

ulcers, as it is possible for such a child having a tuberculous ulcer in the mouth to infect a wetnurse, should it be put to the breast of a sound woman. By reason of the danger of infection the child should be bottle-fed. Should tuberculous peritonitis become evident, the abdomen of the infant should be opened at once, and a drain of iodoform-gauze be introduced. This frequently results in considerable improvement. As a rule, however, cases of this sort terminate fatally with pulmonary or cerebral invasion.

Infection through the mouth. Localized septic infection of the mouth may follow the inspiration of gonorrhœal virus or be acquired from a syphilitic sore upon the breast. A gonorrhœal ulcer has sharply defined edges, covered by a yellowish-gray exudate. It is most commonly situated upon the roof of the mouth, upon the tongue, and pillars of the fauces. With many patients its presence seems to affect the general health but very little, while in others digestion is deranged and general strength suffers.

In rare instances newborn infants are attacked by infectious and contagious pemphigus. This usually appears in epidemics in hospital wards, and is characterized by the rapid development of small vesicles, accompanied by fever and prostration. Although often associated with syphilis, it may appear independently and in varying degrees of severity. Various portions of the body are affected, the face and chest being most frequently involved. The treatment of these cases consists in the free use of applications containing boric acid, either in the form of an ointment or a solution containing glycerin. The strength of these patients must be maintained by appropriate food and stimulants. In the milder forms the prognosis for recovery is good, while in severe epidemics the mortality-rate is high.

It is possible to convey these septic infections of infants from one to another by the hands and appliances of those who care for them. Thus septic poison may be carried to the eyes from the umbilicus, and from the umbilicus of one child to that of another, if cleanliness is not observed in applying the proper dressing. Where several children are cared for by the same attendant, strict precautions must be observed in the maintenance of cleanliness in the hands, while each child should have its separate toilet-articles and separate dressings. In cases of septic diarrhœa diapers should not only be washed, but boiled in antiseptic fluids. Dressings employed upon the umbilicus should be burned as soon as removed, and appliances used for irrigating the eyes should be kept surgically clean. Those who attend infants are themselves liable to infection, as illustrated in the cases in which nurses and physicians have suffered from septic ophthalmia. Intestinal discharges from these patients and also the urine are capable of infecting others, and hence should be sterilized as thoroughly as possible. In hospital wards children should be given separate cribs, and isolation practised with those who are diseased. Although the practice of antisepsis has reduced infection with the mother to a minimum, fœtal mortality from this cause remains unreasonably high.

In rare instances puerperal tetanus is transmitted to the fœtus. Where the mother is profoundly infected the child shares in this fatal compli-

cation. Epidemics are sometimes seen of localized tetanus, known as trismus neonatorum, or of a milder form known as tetany.

The symptoms of trismus neonatorum are spasmodic contracture of the muscles controlling the lower jaw, frequently accompanied by spasm of the muscles of the trunk and extremities. These attacks are excited by efforts to nurse or to drink, and in severe cases by any contact with surface-nerves, even a current of air being sufficient to excite a spasm. It is impossible for the child to take nourishment; and if a tube be introduced within the stomach, it must be done under partial anæsthesia or the influence of a narcotic, the child's breathing frequently becoming very much embarrassed during the procedure. Recovery of children from this disease is rare, as the strength speedily fails, while fever develops with exhaustion, and cerebral or pulmonary œdema. Treatment should be addressed to modifying the spasmodic condition by the use of hydrate of chloral, a grain in syrup and water for a child six months of age every two or three hours. Alcohol should be employed as freely as the child will take it, and serves a very useful purpose in supporting the nervous centres during the attack. The child may be partially fed by the rectum, if the condition of the bowels permits. While the prognosis is unfavorable, it must be remembered that the infection is an acute one, and that it is possible for the organism to resist the attacking agent.

Cases of tetany sometimes arise without an evident source of infection, and seem to happen in certain times of the year and under climatic conditions of dampness and often of cold. The child betrays a tendency to spasm from any slight cause, but the spasm is of brief duration, the muscular contractions being not of a violent character. In mild cases the child can feed, sleeps fairly well, and under good care will recover from the disorder. The treatment of this condition consists in the use of the milder sedatives, antipyrin in half-grain doses for a child six months of age being given every two or three hours. Alcohol, beef-juice, peptonized milk, should also be employed and the child's nutrition carefully maintained. Gentle massage with olive oil with warm baths is of great importance in these cases. The prognosis must be grave, but still in vigorous children is far from hopeless.

In cases where infants are artificially fed or where care is not taken to keep fermenting substances away from them, fungi may develop in the mouth and by their presence occasion irritation and reflex nervous disturbances. Chief among these is the fungus known as thrush or sprue. This is seen in collections of white patches upon the tongue and about the floor and sides of the mouth, and in aggravated cases the fungus occasions sufficient reaction to cause inflammation. The child is fretful, often desiring to put the finger in the mouth, while occasionally masses of the fungus are swallowed, and occasion disturbance in the stomach and intestine. This condition is to be distinguished from aphthæ, from follicular tonsillitis, and from diphtheria. In aphthæ the patches are of a darker gray, and most often found upon those portions of the mouth which come in contact most readily with the finger or any article introduced within the mouth. In follicular tonsillitis the masses are smaller and often faintly yellowish and situated upon the

tonsil. In diphtheria the patches are a dirty gray, the tissues about are reddened, and the patches are situated upon the fauces and not upon the tongue or cheeks.

One of the most dangerous forms of diphtheritic infection is that of the post-nasal region. The throat may be free from deposit, but the child ejects from the nostril or from the mouth a dark mucous secretion, sometimes slightly offensive in odor, and sometimes streaked with blood. The symptoms of constitutional prostration are out of proportion to the extent of the lesion or its apparent severity. The temperature may be even below normal, but the pulse is rapid, the child feeds poorly and is apathetic. In such cases, wherever possible, the services of a specialist in diseases of the mouth and throat should be secured. Under proper manipulation the nares, posterior nares, and pharynx should be thoroughly disinfected, and the child given at once an injection of antitoxin. For disinfection in diphtheria in young children the following solution has been found of especial value:

Hydrogen peroxide	℥ 3.
Powdered boric acid	grs. 60.
Water to make 6 ounces.	
Used locally by means of spray.	

Stimulants and careful feeding are also required in these cases, with a prompt renewal of the antitoxin injection should the symptoms demand.

The treatment of thrush consists first of all in removing from the child's diet fermenting articles, and especially cane-sugar. If the child requires sweet, milk-sugar or saccharine may be employed. In destroying the fungus two objects must be kept in mind—first, the application of a proper antiseptic to the fungus; and, second, the avoidance of wounding the tissues. Although many substances have been tried to destroy this invader, experience has shown that none is so efficient and harmless as boric acid. This may be combined with glycerin, with sufficient water to make a convenient solution, and applied to the diseased surfaces by a very soft camel's-hair brush. In cases where the child resists applications of this sort the remedy may be introduced into the mouth by spray. It is sometimes desirable to employ a dilute solution which may be swallowed without injury. Where gastro-intestinal irritation is occasioned by thrush, it is well to empty the intestine thoroughly, and then to administer a dilute solution of boric acid in small but repeated doses.

A useful borated solution for these cases is made as follows:

Powdered boric acid	grs. 60.
Glycerin	℥ 1.
Water to make 6 ounces.	

The newborn infant, when artificially fed, is liable to disease through germs introduced within the body in its food. As milk is the substance most often given, it follows that milk and drinking-water are the most common conveyers of such infection. Although the intestinal tract of the healthy child contains bacteria, they are of such a

nature as to do no violence to the tissues, and serve a useful purpose in promoting digestion. When, however, those varieties of bacilli are introduced which cause fermentation, they and their products set up an irritation which speedily results in inflammation. This is accompanied by a free discharge of mucus, by fever and by diarrhœa, and in extreme cases, where the process is not checked, by exhaustion, cerebral anæmia, passive œdema, and finally death.

Infection of the digestive tract. The symptoms of infection of the digestive tract in infants are vomiting, purging, the formation of gas, the discharge of stools containing mucus, fermenting food, and abundance of bacteria. In severe cases the epithelia of the intestine are denuded, the submucous tissue becomes the seat of inflammation, and pus is added to the stools. Colitis and entero-colitis are the lesions found in these cases. The continued loss of water from the blood through frequent evacuations favors congestion and transudation of serum in the cerebral tissues, and passive œdema of the ventricles is often found in these cases. These patients waste very rapidly, the abdomen may be distended with gas or sunken and retracted, while the expression of the face is drawn and pinched. The color of the stools in these cases is often green, brown, rice-water in appearance, or dark from disintegrated blood. The precise cause of green stools in infants is not fully determined, but there is reason to believe that they arise from an excessive acid fermentation which may be inhibited by the administration of lactic acid.

In addition to bacilli which may be present in infected milk, a poisonous substance, tyrotoxicon, has also been found. It is commonly discovered in milk which has stood in the presence of decomposed vegetable matter. It produces, when taken into the organism, violent vomiting and purging, followed by collapse and the symptoms usual in severe ptomaïne-poisoning. In severe cases its effects may prove rapidly fatal. In addition to bacilli introduced in milk through filth and fermenting vegetable and animal matter, the breast of the mother, if tuberculous, may furnish tubercle-bacilli in the food of the infant. Such may also be found in cow's milk, while the germs of scarlatina or of typhoid may also be present in milk.

The question of artificial feeding of infants evidently demands the application of our knowledge of antisepsis. To render milk safe food for infants it must be sterilized, and the full consideration of this topic will be given under the head of Artificial Feeding.

The treatment of infection of the digestive tract in infancy requires, first, the absolute withdrawal of all forms of food likely to convey infectious germs. Milk must immediately be withdrawn from the child's diet. The intestines must then be emptied as thoroughly and gently as possible of decomposing food, abnormal secretions, and infecting germs. This is best accomplished by the administration of castor oil, accompanied by an alcoholic stimulant or an antispasmodic. For an infant six months old a dessert- or tablespoonful of castor oil may be given, followed by fifteen drops of brandy. If the first dose is vomited, a second should be tried. The frequent stools and copious evacuations cause in the child intense thirst, and the tendency to passive congestion

demands the free use of water. Advantage may be taken of this to give the child an abundance of very dilute and easily assimilated nourishment. This is best obtained by beating up the white of a raw egg in eight ounces of water, adding to it a little salt and sugar to the taste, and giving a teaspoonful to the child as often as it will take it. It is often well to substitute for water barley-water, combining the egg as before. Brandy is also indicated, but should be given at regular intervals and well diluted. A half-teaspoonful of beef-juice or tablespoonful of freshly made chicken-broth will often be retained when other food is rejected.

If the action of the castor oil is not sufficient to check the discharges, the intestines should be thoroughly but gently douched with warm water or with water containing salicylate of sodium, five grains to the ounce. This may be used in the following manner: The child is placed upon its abdomen upon the lap of the nurse or attendant, lying upon a rubber sheet. A No. 12 soft catheter is attached to the tube of a fountain-syringe; the fluid selected should be allowed to run through the catheter, which is introduced as far as it will conveniently enter the bowel. From a quart to a half-gallon of fluid, at a temperature not less than 100° F., should be allowed to run gently through the tube and into the intestine. As the bowels become distended their contents will begin to escape. The irrigation should be continued until the fluid returns clear. Experiment has shown that there is no danger of rupturing the intestine when the child lies in the posture described, the bag of the fountain-syringe not being higher than three feet above the patient. If the fluid employed is warm, the procedure gives comfort to the child, and it often drops asleep during the irrigation. This method of treatment may be used to advantage twice in twenty-four hours, if demanded. In the majority of cases once daily will be found sufficient. When the fluid returns clear it is well to allow eight or ten ounces of warm water to run into the bowel and to be retained. In long-continued cases in which pus or blood is present in the stools antiseptic irrigation should be employed.

In irrigating the intestine some prefer to employ two catheters, one connected with the fountain-syringe and the other serving to secure a prompt exit from the bowel. These should be small, soft, flexible rubber catheters, and their use is often difficult in young infants, in whom the rectum is small. The second catheter is not essential, but in older children is convenient. The following solutions have been employed to advantage for intestinal irrigation in infants:

Boiled water at a temperature of 100° F.	qt. 1.
Sodium bicarbonate	℥ ½.
Boiled water at a temperature of 110° F.	qt. 1.
Sodium salicylate	grs. 20.

Bichloride of mercury solution, 1 : 10,000, followed by boiled water, temperature 100° F., 1 quart, sodium chloride, 2 drachms; thymol solution, 1 : 1000, 1 quart; boiled water, temperature, 100° F., 1 quart, creolin, 30 drops; boiled water only, temperature, 100° F., 1 quart.

In extreme cases where collapse threatens artificial heat and the continued use of stimulants are required.

As these cases usually occur in hot weather, when milk most readily decomposes, the child should be taken to a cooler climate as soon as possible. When improvement begins the child should be fed cautiously with small quantities of meat-juices, with white of egg, and barley-water. When milk is attempted, it should be sterilized and prepared for digestion by the use of extract of pancreas.

The medicinal treatment of this disorder calls for the administration of stimulants, and for the local use of appropriate antiseptics. Opium is rarely needed, and when given should be used in the form of the camphorated tincture.

Hemorrhage in infancy. The newborn infant is liable to several varieties of hemorrhage. Bleeding from the umbilicus may occur from improper ligation of the cord, or from an anomalous distribution of bloodvessels, or by reason of a disordered state of the blood itself. When the cord bleeds persistently it should be stripped and ligated in several places. Bleeding from the umbilicus itself may be checked by the application of pressure, or by the passage of pins beneath the vessels with a figure-of-eight ligature drawn tightly about them. Pressure by a pad and bandage is also indicated. Cases are occasionally met with, however, where, in spite of all precautions, fatal oozing of blood from the umbilicus occurs.

Hemorrhage from mucous surfaces is observed in some infants. This is caused directly by an altered condition of the blood, and must be treated by those remedies which increase the red corpuscles and hæmoglobin. The condition which renders such hemorrhage from mucous surfaces possible is anæmia, which can usually be traced to a pathological condition of the mother before the birth of the child.

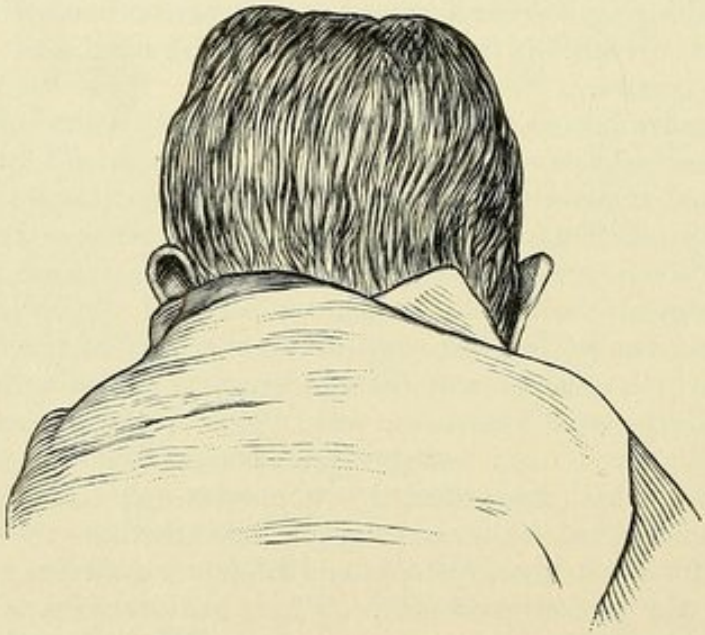
Infants occasionally die from profuse hemorrhage of the stomach and intestines, in which ulceration of the duodenum is found to be the cause. Thrombosis of the umbilical vein, persistence of the ductus arteriosus, and hæmophilia have been assigned as causes. Excessive secretion of the gastric juice, which had affected the mucous membrane of the intestine, has been assigned by some as the cause of this condition. The child may suffer from bloody stools and bloody vomit for several days. In rare cases the patient recovers. These hemorrhages are often described under the title melæna neonatorum. But little can be done in the way of treatment, as all remedies are practically unavailing.

Caput succedaneum; cephalhæmatoma. Collections of blood and serum are observed upon various portions of the child's body as the result of mechanical pressure during birth. By caput succedaneum is understood a boggy tumor upon the scalp caused by the infiltration of the tissues with serum, and forming during labor. During the passage of the head through the pelvis the greater portion is subjected to pressure by the pelvic walls. There remains, however, a considerable area of the head which is not pressed upon, and in which serum and blood naturally accumulate. The caput succedaneum is found upon that portion of the head opposite the presenting part. As the vertex and left parietal bone most commonly

present, the caput succedaneum is usually found upon the right parietal bone. By observing the position of this tumor the position and presentation of the child during labor may be reasonably inferred. Where the child has been subjected to severe pressure the entire vertex of the scalp may become swollen, and the tumor cover the larger portion of both parietal bones. A secondary caput is sometimes observed in the median line upon the occipital region, in cases where the head has remained upon the pelvic floor for a considerable time after rotation has occurred. In cross-births a tumor may be found upon the shoulder which presents.

Caput succedaneum is not of practical importance unless the tissues become the seat of septic infection. Should this occur abscess will form, requiring incision and drainage. In cases where the scalp is greatly swollen it is advisable to bathe the child's head with warm water or to apply an alcoholic solution of camphor. The application of ammonium chloride is also advised by some. If the tumor persists, it should be incised under antiseptic precautions, and pressure made with borated cotton. When abscess forms the sac should be irrigated with creolin, $\frac{1}{2}$ per cent.

FIG. 212.



Double cephalhæmatoma.

An effusion of blood between the periosteum of the skull and the bone is termed cephalhæmatoma. An effusion of blood beneath the aponeurosis of the scalp is styled by some a false cephalhæmatoma. The mode of formation of the tumor is explained by the existence of the various layers of the periosteum of the skull. The blood-clot, forming between the bone-producing layer and the bony tissue, prevents the growth of new bone. At the border of the clot the periosteum and bone unite. The exact method of formation in cephalhæmatoma is not always clear. Difficult labor does not produce it; it usually is found upon some other than the presenting part of the head; its

borders are well defined; it does not cross sutures, nor does it alter the color of the scalp. Fluctuation is usually found over the centre of the tumor. It continues to increase steadily for some time after labor.

Observation shows that an ill-nourished condition of the child undoubtedly favors the occurrence of cephalhæmatoma. While extravasations of blood may occur within the cranium, cephalhæmatoma is almost never found beneath the internal periosteum of the skull. Males are more frequently affected than are females, while the tumor generally occupies the right side of the head. Children born of primiparæ show this complication most often. On palpating such a tumor the sensation of doughy resistance is encountered, with obscure fluctuation over the centre. The sensation of crackling may be elicited, while the contents of the tumor appear to move in an irregular manner under palpation. The tumor is very rarely painful. The bony margin of cephalhæmatoma forms very gradually. The content of the tumor is extravasated blood, which is at first coagulated and then breaks down and becomes liquid. Soon after the formation of the tumor, if it be incised, the blood is found bright red, while later it is much darker in color. While the tumor is usually single, the writer has observed two upon the same infant, while three have been noted by others.

While direct and excessive violence may not be present in causing this condition, still the pressure upon the head during labor in an ill-nourished child must be considered as the primary cause. Hence it is that this condition may follow rough handling of the child by careless nurses after birth. The size of the mother's pelvis seems to have but little influence in determining this condition. Spiegelberg found cephalhæmatoma upon the head of an infant *in utero* before active labor began. It is quite possible that his belief that asphyxia had something to do with the formation of the tumor may have been correct.

Cephalhæmatoma may be followed or accompanied by cerebral hemorrhage, leading gradually to a fatal issue. In these cases a history of prolonged or vigorous labor is usually given.

The diagnosis of this complication is rarely difficult. It is readily distinguished from caput succedaneum by its sharply outlined border, by the fact that caput succedaneum does not cross the sutures of the skull, by the difference in color, and the fact that cephalhæmatoma tends to increase after birth, while caput succedaneum gradually disappears. Cerebral hernia usually is found in the line of sutures near the occiput. Pressure upon such a tumor causes manifest irritation of the brain. Aneurism pulsates, and is much darker in color and lacks the history of cephalhæmatoma. In stillborn children extravasations of blood may be found in the occipital region somewhat resembling cephalhæmatoma. If examined, however, it becomes evident that they have been caused by pressure during birth and that they are limited to the scalp. Examination of the skull by palpation will readily establish the differential diagnosis between cephalhæmatoma and encephalocele. Where craniotabes is present, detached and softened pieces of bone may give a sensation to palpation resembling that of cephalhæmatoma. Swellings upon the head in living children, caused by injury, are painful to the touch and are diffused.

The usual tendency of cephalhæmatoma is to reach its greatest size within six to eight days after birth. This would indicate that interference during the first ten days of the infant's life is unnecessary, unless the tumor increases rapidly through considerable hemorrhage. It is well to make gentle and continuous pressure, by placing a pad of antiseptic material upon the scalp and retaining it by a suitable cap. Where, however, the tumor continues to enlarge, its surface should be carefully cleansed and thoroughly disinfected, and the tumor should be incised. It is better to open the tumor freely than simply to puncture it with a bistoury. It should be emptied and packed with gauze. In most cases it is best not to employ bichloride of mercury or carbolic acid because of their poisonous properties. Boric acid or thymol may be used to advantage.

Hæmatoma of the sterno-cleido-mastoid muscle. This muscle is occasionally the seat of fibrous change which occurs at birth. Breech presentation is most favorable for this complication, because these muscles are subjected to direct pressure during the extraction of the child. Torticollis does not accompany or follow necessarily this condition, although it is most common in prematurely born children. Contracted pelvis does not seem to be an element in causing its production. While this condition is rarely serious, changes in the muscles may go on which would ultimately lead to permanent shortening. It is important that, before this may occur, the child be treated by suitable massage and manipulation.

Multiple visceral hemorrhage. One of the most frequent and most obscure causes of infantile death is found in hemorrhage into the viscera, occurring during labor and continuing after birth. While pressure is the most frequent cause, intrauterine asphyxia is also a frequent factor. The condition of the child's blood is the principal predisposing element in these cases. Germ-infection most often causes profound alterations of the blood, frequently occurring before birth and resulting in hemorrhage during labor. The symptoms of this condition are gradual failure in strength, circulation, and respiration, while the functions of digestion are in abeyance or but imperfectly performed. Fever is absent, and the child grows progressively weaker, finally perishing a few days after labor. Upon examination no lesion to account for the condition is apparent. Post-mortem examination reveals multiple hemorrhage into the brain, liver, lungs, and other viscera, and, in severe cases, into the substance of the muscular system. As the head is most often subjected to pressure, the brain is the organ most frequently the seat of this complication. Delivery with forceps, especially in cases where the instrument is applied with difficulty, is frequently followed by this condition. Meningeal hemorrhage may occur, with extravasation of blood beneath the dura. Evidences of intracranial lesions are wanting. In many cases, including forceps deliveries, no lesion of the cranium can be found. Where hemorrhage occurs into the lung, pneumonia may supervene. Examination of the histories of these cases shows that most of them occur where considerable disproportion between the child and the pelvis exists. The mortality-rate for visceral hemorrhage is high, although it cannot be accurately estimated, as many cases of mild degree do not prove fatal and are not subject to autopsy.

The treatment of this condition lies principally in its prevention. Thorough examination of the mother before labor will lead to detection of abnormality in the pelvis and also to excessive size of the fœtus. The induction of labor would then save the child from the dangers of this complication. In the presence of the actual condition but little can be done. If positive symptoms of cerebral compression develop and depression or fracture of bones of the skull be present, surgical interference is indicated; but unless such be the case the physician's efforts must be addressed to maintaining the digestion and general strength of the child.

Fractures and dislocations. The fœtus may sustain fractures while *in utero* from direct violence, or from disease which affects the skeleton. Care should be taken to differentiate between such cases and those in which adhesion of the amnion may have occasioned deformity during embryonal life. The simulation may be complete, and spurious callus may be present in considerable amount. In cases of malformation the fingers and toes are usually abnormal.

The clavicle, humerus, and femur are the bones most often fractured during labor. In children with excessively broad shoulders it may be impossible to deliver the trunk of the child without fracturing one or both of the clavicles. This is especially true of delivery in breech presentation where the shoulders fail to descend. Injury to the brachial plexus may accompany severe fracture of the clavicle and produce permanent deformity. The humerus may be broken in bringing down the arms of the child when they become extended above the head in breech presentation. The fracture is usually at the junction of the upper two-thirds with the lower third. Dislocations in the fœtus are the result of violence during extraction, and may be accompanied by separation of the epiphyses. The femur is usually broken when fracture occurs during version or difficult extraction.

The treatment of fractures and dislocations in the newborn is based upon the usages of surgery. Splints may be employed, of soft material and carefully fitted to the child. If the child can be kept upon its back for considerable periods, fracture of the clavicle will usually heal without deformity. In fracture of the humerus thicker splints should be used, which can be softened in hot water and accurately fitted to the limb.

The prognosis in these cases is usually good. Such fractures are rarely compound or comminuted, but are "green-stick," and hence easily united. The prognosis of congenital malformations must be very guardedly given. Webbed fingers and toes may be dissected apart, while supernumerary digits are readily removed.

Acute peritonitis may develop as a consequence of erysipelas or an abnormal condition developing in the intestine. The lymphatic channels of the abdomen in infants transmit poison so rapidly that the condition becomes pronounced very soon after birth.

The **mammary glands** in newborn children often exhibit evidences of acute inflammation, producing mastitis. This, however, is usually of the simple catarrhal variety, and is rarely followed by suppuration. In many cases the breasts are simply engorged, and under precautions

to maintain cleanliness infection does not occur. Where, however, abscess results it should be promptly emptied, disinfected, and drained. The condition, however, usually disappears within a few days.

Diseases of the nervous system in infancy. Among the most interesting of the disorders to which the infant is subjected before and after birth are those which affect the brain. In a large number of cases these affections result in palsy. Cerebral palsies are spastic in character, and according to distribution may be divided into hemiplegia and diplegia or paraplegia. Of these the first is least common. The cerebral palsies of children usually follow coma and convulsions, followed by epilepsy, with characteristic mental impairment. As regards the site of the palsy, Sachs and Peterson found in 225 cases right hemiplegia in 81; left hemiplegia in 75; diplegia in 39; and paraplegia in 30.

Many of these palsies begin during intrauterine life, although some time may elapse before it is evident that the child's cerebral condition is abnormal. Many cases thought to begin during the first years of life date back to intrauterine existence. The two factors most powerful in causing these conditions are difficult labor and premature birth. Heredity plays also an important part, as does mechanical injury to the mother. Severe illness of the mother during pregnancy also produces these conditions. The writer recently had the opportunity to examine a child, aged sixteen, whose mother had typhoid fever severely before her birth. The child has spastic hemiplegia, which, however, is undergoing steady improvement. It is remarkable that syphilis seems to have but little influence in bringing about these conditions. Sachs has shown that tedious labor more often causes cerebral disease than does instrumental delivery. Asphyxia is also an important factor, and first-born children are naturally more exposed to this complication. The possible occurrence of injury to the brain during protracted labor should lead the physician to terminate delivery as promptly as possible, in accordance with the interests of the mother. Peterson and Spencer believe that hemorrhage into the spinal canal and cord is also a not infrequent cause of palsy.

In 75 per cent. of diplegias and paraplegias contractures and rigidity develop. The flexor muscles are most often involved. Choreic movements and atrophy of the muscles occasionally follow intrauterine cerebral disease, and also asymmetry of the body. Epilepsy and idiocy and all degrees of mental deficiency may be observed in these cases.

Large cerebral defects are frequently found upon post-mortem examination of these patients. Half of an entire hemisphere or of both may be lacking in these patients. In birth-palsies meningeal hemorrhage is a frequent cause of the diseased condition.

The cerebral palsies of the newborn are classified by Sachs as follows:

CLASSIFICATION OF INFANTILE CEREBRAL PALSIES.

Groups.	*Morbid lesion.*
I. Paralysis of intrauterine onset	Large cerebral defects (porencephaly). Defective development of pyramidal tracts. Agenesis corticalis. (Highest nerve-elements involved.)
II. Birth-palsies	Meningeal hemorrhage, rarely intracerebral hemorrhage. Later conditions: Meningo-encephalitis chronica, sclerosis, and cysts; partial atrophies.
III. Acute (acquired) palsies	Hemorrhage (meningeal, and rarely intracerebral); thrombosis (from syphilitic endarteritis and in marantic conditions; embolism. Later conditions: Atrophy, cysts, and sclerosis (diffuse and lobar); meningitis chronica; hydrocephalus (seldom the sole cause); primary encephalitis; polio-encephalitis acuta (Strümpell)

The amount of damage which the child's nervous system sustains during labor may be inferred from the symptoms present in the first few days after birth. With extensive meningeal hemorrhage convulsions occur early, accompanied by paralysis. As regards the morbid anatomy of the acute cerebral palsies, Peterson and Sachs analyze the records of 78 autopsies as follows:

Lesions.	Number of cases.
Atrophy, sclerosis, and cysts (terminal conditions)	40
Porencephalus	2
Hemorrhage	23
Embolism	7
Thrombosis	5
Tubercle	1
Total	78

A diseased condition of the bloodvessels, probably fatty degeneration, is undoubtedly present in many of these cases.

As regards the prognosis of congenital cerebral palsy, no definite knowledge can be obtained for weeks and months after delivery. Most infants severely injured during birth die soon afterward. If, after a short time, the child begins to improve and the improvement is steady, a more favorable view of the case may be taken.

As regards the treatment of cerebral palsies of infancy, the child should not be molested at first. It has been found by experience that interference does not expedite the child's recovery. Especial attention must be paid to the nutrition of the child, and sedative drugs employed as rarely as possible. Convulsions must be controlled by chloroform. But little reliance is to be placed upon drugs. The electric current and massage are indicated in the later stages.

In distinction from the foregoing are what are termed obstetrical palsies. These depend upon some manipulation during birth. They occur most often in cases delivered by the forceps or by version, and in those parts of the body where large nerve-trunks are least thoroughly protected from pressure by overlying tissues. The brachial plexus is especially apt to be affected in cases where the arm is displaced during labor, and the physician must insert the hand into the uterus and

dislodge the arm. Occasionally dislocation of the humerus will cause prolonged pressure, resulting in long-continued or permanent disability. Atrophy of the muscles and variation in the response to the electric currents are also present. A differential diagnosis between obstetric palsies and cerebral birth-palsies is clearly set forth by Sachs:

Peripheral palsies (obstetrical palsies of brachial plexus).	*Cerebral birth-palsies.*
1. Arm only affected.	1. Hemiplegia or diplegia common ; brachial monoplegia rare.
2. Flaccid paralysis with atrophy.	2. Spastic paralysis, with or without atrophy, with tendency to rigidity.
3. Deep reflexes absent, surely not exaggerated.	3 Deep reflexes increased.
4. Changes in electrical reaction from simple loss of faradic response to complete reaction of degeneration.	4. No changes in electrical reaction.
5. No convulsions.	5. Convulsions apt to occur and to be repeated.
6. Deformity and arrested growth of entire extremity.	6. Flexion contraction of fingers, wrist, and elbow.
7. Sensation may be impaired.	7. Sensation not affected.

As regards the treatment of obstetric palsies, the affected limb should be bandaged in cotton and kept perfectly at rest. After two weeks of rest, light friction and massage may be employed. In from four to six weeks after birth the mild faradic current should be used, but, if this fails to affect the muscles, the galvanic current should be employed. When contractures tend to develop the affected limb should be put in a splint. Idiocy and imbecility follow injury to the brain acquired during birth or immediately afterward, and choreic movements not infrequently develop.

CHAPTER VI.

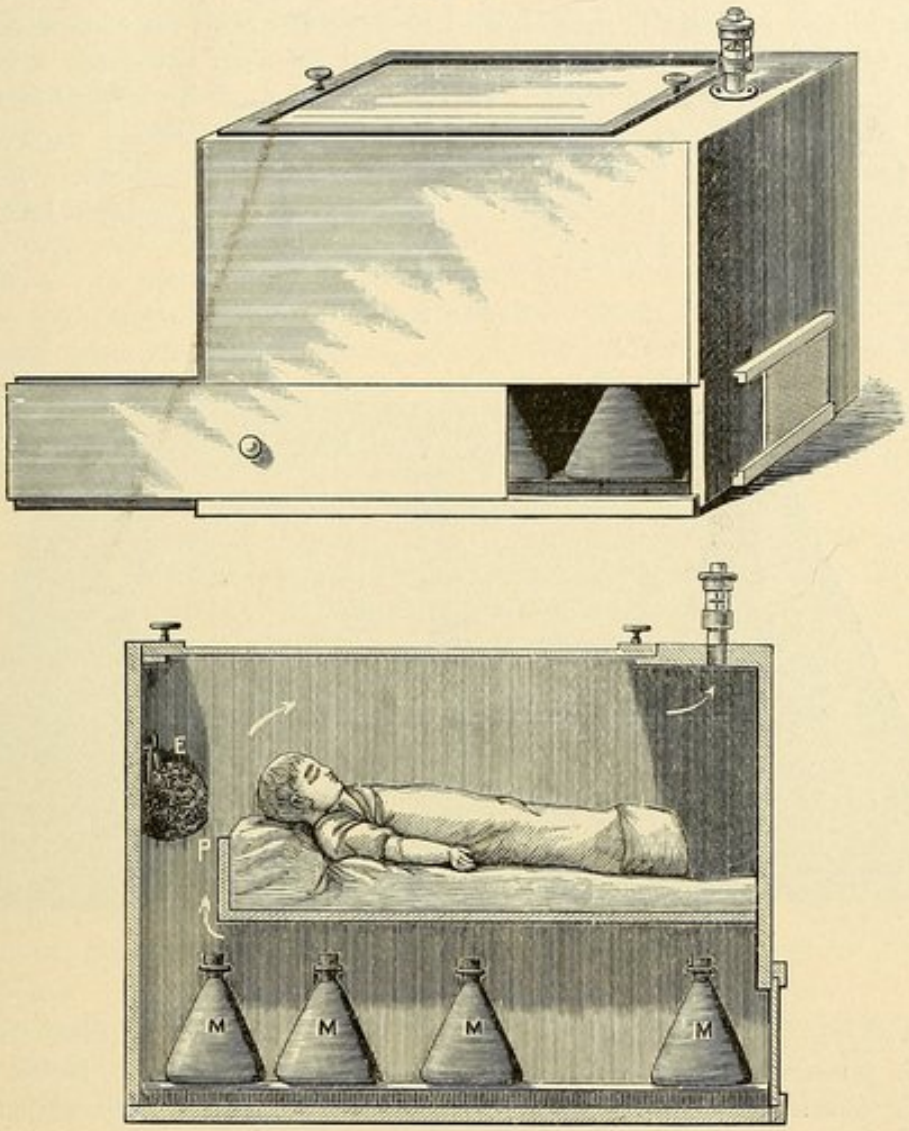
INCUBATION AND ARTIFICIAL FEEDING.

By incubation is understood the maintaining, for the infant, of an artificial temperature most closely resembling that of intrauterine life. It is evident that this is indicated in cases of prematurely born children, or in those imperfectly developed. This method of treatment has a wide range of usefulness, not only in furthering the life and development of the weak infant, but also in treating many of the disorders to which infants are liable. In cases of broncho-pneumonia, in anæmia, and collapse following asphyxia or visceral hemorrhage, incubation will add greatly to the child's chances for recovery.

This procedure may be accomplished in one of two ways—either by so enveloping the child that it shall retain its own body-heat, or by placing it in an artificially heated atmosphere. Both are usually combined in cases of prematurely born children. Where it is desired simply to preserve the body-heat of the child it should not be dressed in the

usual manner, but enveloped in cotton or wool and bandaged loosely with wide cheesecloth or flannel bandages. The surface of the body should first be oiled, and the envelope may extend to the eyes and mouth. This can be so arranged that soiled material can be readily removed, and cleanliness thus maintained.

FIG. 213.



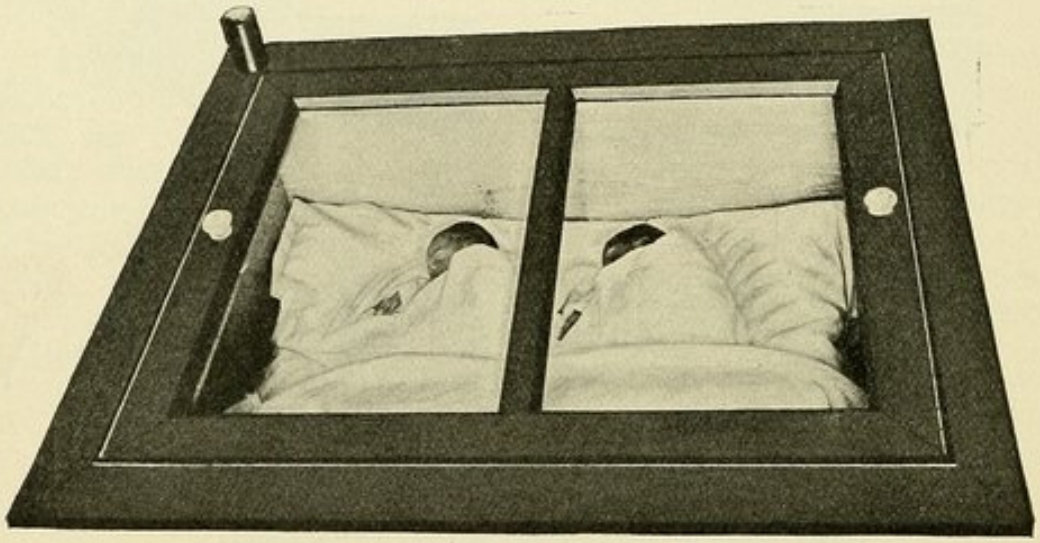
A simple incubator. (After AUVARD.)
M, hot-water cans. E, moist sponge. P, child's bed. A, arrows showing current of air.

Various sorts of apparatus have been designed for surrounding the newborn infant with an atmosphere of artificial heat. The simplest of these consists of a basket in which blankets are placed, and in which cans or heated bricks or flatirons may be employed as sources of heat. The child may be placed in such a basket and a loose blanket thrown lightly over it. More elaborate incubators consist of boxes with glass top, so arranged that a source of heat is supplied, while air gains entrance to the child. In the most elaborate forms of incubators an apparatus is also supplied for furnishing oxygen, and also for regulating the temperature to a very accurate and minute degree. While as objects of

interest and scientific apparatus elaborate incubators may attract the attention of the physician, for practical purposes they are inferior to the simpler forms of apparatus.

We have had excellent results in the use of a wooden box having a false bottom, upon which the child is placed. Heat is supplied by hot water, in tin cans made to extend the entire width of the box. Air gains entrance at the bottom of the box, is warmed by passing over the cans, circulates about the infant, and escapes through an escape-pipe in the top of the box. A thermometer placed beneath the glass cover indicates the temperature within. It has been found by experience that if one can be replenished with water, not quite boiling, each hour, that a temperature of from 90° to 95° F. can be maintained. Among the most complete of incubators is that of Tarnier, which has been greatly simplified by Auvard.

FIG. 214.



Large incubator with twins.

In practising incubation it is essential that the child be disturbed as little as possible. It should not be removed to nurse, as feeble children are usually not sufficiently strong to suck. The milk should be pumped from the mother's breast, placed in a glass vessel surrounded by warm water, and dropped into the mouth of the child with a glass pipette. This may be made in convenient sizes, and graduated, so that it may be evident how much is given at each feeding. It is well to feed small amounts often, and in the first days of life a child will rarely take more than a drachm given every hour or two. The child should not be removed from the incubator to feed it, but the cover should be taken off and the milk dropped into the child's mouth with the pipette. Such infants should not be bathed until they increase very considerably in strength. It is possible to maintain cleanliness, by replacing a portion of the cotton envelope of the child as often as it becomes soiled. When the infant is sufficiently strong to bear manipulation, it should be gently rubbed with olive oil, two parts, and alcohol, one. Such a

child may be given water freely in the same manner in which it is fed. The degree of heat which a child requires in an incubator varies somewhat with the development and peculiarity of the child. For the first two or three weeks of life children are most comfortable at a temperature varying but a few degrees from 90° F. After this they seem best satisfied with a temperature ranging from 80° to 85°. The change from the incubator to the external air must be brought about very gradually. Light woollen clothing may be placed upon the child over its cotton dressing. It may be exposed to sunlight, except in the hottest summer weather, with advantage. In removing a child from the incubator it is often wise to cover its head with a light, well-fitting cap.

The use of the incubator is adapted, not only for prematurely born children, but also for those who suffer from asphyxia at birth, or from hemorrhage, or from pressure during labor with following symptoms of shock. In cases of capillary bronchitis the incubator is also a useful means for promoting recovery. In these cases it is not so much the increased amount of heat which the child requires, as the absolute protection from draughts which the incubator affords.

Artificial feeding of the newborn is often a necessity through failure of the maternal supply of food. It may be necessary to feed a child artificially because the mother's milk is deficient in quantity or abnormal in quality, or because the child makes drafts upon the mother's strength which her health will not permit. Cases are sometimes seen in which the milk is slow in forming in the breasts, and in which it is necessary to nourish the child artificially until lactation is established.

In cases where the establishment of milk-secretion is delayed, the best results will be obtained by selecting a suitable combination of cow's milk to take the place of mother's milk. As cow's milk is less digestible than that of the mother, from its excess of casein and deficient fat, it must be modified. If the child has difficulty in digesting milk so diluted, barley-water or oatmeal-water may be substituted for the water used to dilute the milk. Milk thus diluted may be given to an infant of normal size and development without the use of digestive ferments.

The most rational basis for the preparation of infant's milk is found in chemical analysis of mothers' and cow's milk. The following are given by Rotch as taken from a normal woman and a sound cow:

Breast-milk.		*Cow's milk.*	
Fat	4	Fat	4.04
Sugar	7	Sugar	4.55
Proteids	1.50	Proteids	4.15
Ash	0.15	Ash	0.71
Total solids	12.65	Total solids	13.45
Water	87.35	Water	86.55
	100		100

For convenience and accuracy in prescribing it is well to retain percentages to designate the composition of a given food. This is readily done in sending to a milk-laboratory, but in domestic practice the physician must retain ounces or tablespoons as units of measure. The

following illustrates a milk-laboratory prescription for an infant ten days old:

THE WALKER-GORDON LABORATORY.

	Per cent.	*Remarks.*	
Fat	4	Number of feedings	10
Milk-sugar	7	Amount of each feeding	℥2
Albuminoids	1.50	Infant's age (days)	10
Mineral matter	0.15	Infant's weight	...
		Alkalinity	... per ct.
Total solids	12.65	Heat (6 minutes)	167° F.
Water	87.35		
	100		

If cream obtained by skimming is used, the following formula has been found useful by Morse and others:

Upper one-quarter of milk set for cream	4 ounces.
Lime-water	1 ounce.
Water	15 ounces.
Milk-sugar	$6\frac{3}{4}$ drachms.

For a child two weeks old.

Starr advises, for the artificial feeding of an infant from birth to seven months, the following:

Age.	Cream.	Whey.	Milk.	Milk-sugar.	Salt.	Water.	Hours for feeding.	Intervals of feeding.	Total quantity.
During 1st week	f℥ij	f℥iij	...	gr.xx	.....	f℥iij	5 A.M. to 11 P.M.; sometimes 1 A.M. and 3 A.M.	2 hours	f℥xij
From 2d to 6th week	f℥ij	...	f℥ss	gr.xx	a pinch	f℥j	5 A.M. to 11 P.M.	2 hours	f℥xvij
From 6th week to end of 2d month	f℥ss	...	f℥x	℥ss	a pinch	f℥x	5 A.M. to 11 P.M.	2 hours	f℥xxx
From 3d to 6th month.	f℥ss	...	f ℥ij	℥j	a pinch	f℥iss	5 A.M. to 10.30 P.M.	2½ hrs.	f℥xxxij
During 6th and 7th months	f℥ss	...	f℥iijss	℥j	a pinch	f ℥ij	7 A.M. to 10 P.M.	3 hours	f℥xxxvj

Recalling the capacity of a child's stomach, it must be remembered that an ounce is quite sufficient during the first few days of life, and that after that two ounces at a feeding will suffice for the first week or two. It is best to employ the nursing-bottle, as the child takes most kindly to this form of substitute for the mother's breast.

In delicate women a secretion of milk, although abundant for the first month or two after the birth of the child, may become greatly reduced after the mother assumes her usual duties. This is a plain indication to relieve her of the tax upon her strength by partially feeding the infant. The mother may retain her milk by nursing the child several times daily. It is well to give the child the bottle at first once daily in the forenoon, and afterward at morning and afternoon, and finally allowing the child to nurse only at night and morning. This plan has the further advantage that, should the mother become ill, the child is already accustomed to artificial food, while, on the other hand,

if the child becomes ill, the mother will still have sufficient for its enfeebled power of digestion.

The bacteriological examination of an ordinary sample of cow's milk reveals the presence of numerous bacteria and of considerable quantities of foreign matter, some of which is partially decomposed organic material brought from dirty dairies. The study of enteritis in children has informed us of the fact that these disorders are caused by the presence of bacteria such as are found in milk. The natural application to be made from these facts lies in the effort to procure for infant-feeding aseptic or pure milk, or, failing in this, to render milk sterile before giving it to children. Further investigation by Leeds has shown that prolonged sterilization by heat destroys the digestive properties of milk, and robs it of much of its nutritive value. In view of these facts, it is most desirable to obtain aseptic milk for infant-feeding rather than to sterilize milk by the application of heat.

The first step in securing pure milk lies in the selection of proper herds and in the maintenance of proper hygiene for cattle, with accurate cleanliness in dairies. In choosing cows to furnish milk for infants, finely bred animals, producing large quantites of cream, should be avoided. The average pasture-cow, sound and free from disease, is preferable. The child should not be limited to the milk of a single cow, but mixed milk from several animals should be chosen. Tubercular infection is sufficiently common among cows to render the application of the tuberculin-test advisable in dairy herds. Cows kept for such purposes should have carefully selected pasture, and should be fed under intelligent supervision. A plentiful supply of pure water must also be available for them. Care should be taken that cows which have suffered abortion should not be used for dairy purposes until they have thoroughly recovered. It has occasionally been observed that animals suffering from retained placenta, with septic infection, have been found in herds from which milk was taken for infant-feeding. It can scarcely be wondered at that pus and bacteria from such animals have been found in their milk.

The stables in which dairy-cows are kept must be scrupulously clean. The animals should not be permitted to stand upon decomposing bedding and feces, and care should be taken that ventilation is abundant and that sunlight finds free access to the stable. The floor should be frequently washed, and haylofts should be thoroughly dry and well aired. The animals themselves must be kept clean, and it is often advantageous to groom them to prevent hairs from falling into the milk. Before milking, the teats of the animal should be thoroughly washed with soap and water, and occasionally with boric-acid solution. When the animal is milked, care should be taken that the cow stands upon a clean surface which will not yield dust when the animal stamps or moves about. Precautions must also be observed that the cow does not soil the milk with particles of manure transferred by the tail. It is important that the milker should be cleanly dressed in material which can be washed, and that his hands should be aseptic. The milk should be received into vessels which have been scalded, cooled as rapidly as possible, and strained through sterile gauze into

clean glass jars, and immediately sealed and sent to the consumer. It is also well to affix to each jar a label, giving the time at which the milk was taken and the name of the person who milked. Milk so furnished is practically sterile, and needs no sterilization at high temperature.

It has been found that, to obtain an accurate amount of fat from milk, it is more advantageous to employ centrifugal force than to rely upon the rising of cream. Centrifugal cream may be reckoned at from 16 to 20 per cent. fat, and thus used in preparing infant's food. The advantages of such fat are its freedom from bacteria and from some of the fat-acids which are often present in cream as ordinarily obtained. Separator cream is also much cleaner than cream obtained by the ordinary rising of milk, because dirty and extraneous matters commonly contained in milk are mechanically removed by the process of separation. Such cream is often found to be practically aseptic and sterile.

The apparatus employed to convey milk to the child must be kept thoroughly aseptic. Nursing-bottles made with rounded corners and without crevices are to be chosen. Pure gum nipples of black rubber and large enough to be turned inside out and cleaned are best. Under no circumstances is a bottle with a nipple and tube to be chosen. The articles required to prepare milk properly for an infant are a half-dozen nursing-bottles, a glass measure to contain two or three ounces, and graduated; a glass funnel, litmus-paper, a dozen nipples, a brush for cleansing the bottles, and aseptic or borated cotton. A sterilizer is convenient, but not at all indispensable. Milk-sugar should also be in readiness. An alkaline solution, either lime-water or bicarbonate of sodium in solution, may be employed, or a given quantity of soda may be added to each bottle. Bottles must be cleansed by boiling with the free use of soap and hot water, and frequent rinsing in hot soda-solution. The brush must also be used, should curded milk adhere to the bottle. When not in use the bottles may be kept filled with boric-acid solution or with solution of soda. The rubber nipples are to be thoroughly washed in soap and hot water, well rinsed, and kept, when not in use, in boric-acid solution.

Investigation has shown that unless one is positively informed regarding the circumstances under which the milk was produced and furnished, that it is the part of wisdom to destroy noxious bacteria which may be present. This may be done by heating the milk to 167° F. for six minutes; such a process is known as Pasteurization. It is difficult, however, to obtain an exact measurement of temperature in milk without apparatus constructed for the purpose. It is found that, practically, the temperature desired is obtained by scalding milk for ten minutes. This may be readily accomplished as follows: The desired number of bottles are filled with the mixture of milk to be taken. The bottles are then corked with aseptic cotton. They are placed in a vessel containing water sufficient to cover three-fourths of each bottle. The vessel is then subjected to heat, the water surrounding the bottles allowed to boil, and the milk allowed to simmer for ten minutes. It will usually come to the boil at the end of this time, and no harm will

be done if the milk boils for two or three minutes. The bottles are then placed upon ice until required. When it is desired to use the milk it is again heated to blood-heat in water, the cotton plug is removed, and the rubber nipple slipped over the neck of the bottle. Milk thus treated will remain in good condition for twenty-four hours, and, if kept cold, for a longer time. It has been shown that this process does not lessen the nutritive value or digestibility of the milk.

Milk has been subjected to 212° F. for twenty minutes and half an hour to render it sterile. It is quite possible to destroy bacteria by this process, but the milk is rendered indigestible and not nutritious. Others prefer to sterilize milk at a lower temperature, and while this process is less objectionable, it renders the milk less easily digested. In many instances milk is disintegrated by sterilizing at high temperature, the fat forming in lumps, while the casein and fluid portion of the milk remain unchanged.

Where the advantages of milk-laboratories are at hand milk may be modified and prepared by the direct prescription from the physician. The process of modification consists in separating the fat by centrifugal force, and in adding it to the milk consumed in the proportion desired. The exact degree of dilution necessary is also readily obtained. An alkaline reaction is secured, and the milk is sweetened with milk-sugar. Any method of sterilization desired is employed, and the milk is given to the consumer as a physician's prescription is furnished to his patient by an apothecary. Such opportunities, however, are not afforded to all, and for practical purposes each mother or nurse must conduct her own laboratory. If the physician be intelligent in the matter and prescribes accurately the composition and quantity of food to be taken, the practical difficulties in the way of preparation can usually be overcome.

It is a matter of importance to know upon what indications the quantity of food given to an infant is to be increased or diminished. Children vary in digestive power and appetite and rate of development, so that no fixed rule can be assigned for all. To a healthy, robust infant not more than an ounce of mixture containing milk should be given at a feeding for the first week of life. This quantity may be gradually increased as the child's appetite and digestive power improve. An indication for increasing the food of an infant is its manifest hunger, its progressive gain in weight, and the normal character of its stools. Indications for lessening the amount of food are its rejection or refusal by the child, the presence of undigested curd in the stools, failure to increase in weight, loss of appetite, restlessness, and colic.

It is a question often raised as to whether the composition of the child's food should remain the same as it grows older, or whether the amount of solid matter and the quantity taken should be increased. Some allege that it is irrational to increase the amount of solids, because the composition of mother's milk remains essentially the same up to the time of weaning. Others regard mother's milk as changing frequently under varying circumstances in the amount of solids contained, and prefer to increase the quantity in the milk taken by the child as it develops. The latter undoubtedly gives the better results in practice. The original dilution may be retained with advantage as long as the

child thrives for the first few months of life. The amount of water used in each bottle should then be lessened as the child's digestion will permit.

Indications for enlarging the diet of the child are found in the appearance of teeth. As soon as they are perfectly developed the child may begin gradually to obtain a small amount of starch or fatty food by the use of its teeth. This is best accomplished by allowing the child to gnaw upon a cracker which has been softened by milk or water, and to give it a chop-bone or chicken-bone from which it may derive a small amount of fat. The child will not, however, perform mastication properly until the first teeth are complete.

The intervals of feeding must be gradually lengthened, care being taken that the arrangement of the child's feeding gradually approaches the meal-times of adult life. Artificially fed infants suffer not infrequently from diarrhœa or obstinate constipation. In the absence of an acute attack of diarrhœa it is usually sufficient to dilute the food and to add to it barley-water.

In other children the appearance of diarrhœa demands the entire withdrawal of milk, and feeding upon beef-juice, broth, or egg-albumin with barley-water.

Egg-albumin is best prepared by beating up the white of a raw egg in eight ounces of water, and adding to the eight ounces enough salt or sugar of milk to give a faint taste. Barley-water is prepared by boiling a half-teacupful of barley-grains in a quart of water until the grains are thoroughly disintegrated, and then straining the resultant fluid.

Many children relish their food better if salt is added, and the quantity usually put into a nursing-bottle is what is commonly termed "a pinch of salt;" this corresponds practically to a half-teaspoonful. If it is necessary to render the action of the bottle alkaline, bicarbonate of sodium may be employed in place of salt, ten grains to eight ounces. Others prefer to substitute one ounce of lime-water for one ounce of water. After the first three months of life the formula may be:

Milk	2.
Cream	3.
Lime-water	1.
Water	2.

Sugar of milk 1 teaspoonful.
To make eight ounces.

This may be continued until the sixth month is reached, when the formula may be:

Milk	2½.
Cream	3½.
Lime-water	1.

And water to make 8 ounces, with sugar of milk as before.

This formula will be found sufficient until the child has cut its first teeth at the eighth or ninth month. From this time the formula may be:

Milk	3.
Cream	4.
Lime-water	1.

Sugar of milk 1 teaspoonful.

Many children do well by the addition of dry extract of malt to the milk and cream in the following formula:

Milk	℥ 3.
Cream	℥ 4.
Lime-water	℥ 1.

Extract of malt 2 teaspoonfuls.

If this agrees well with the child, the amount may be gradually increased to one-half ounce. Such a combination is very fattening with some children, and tends to relieve constipation.

The amount which a child may take should not be over one ounce at a time for the first week or ten days of life, two ounces for the second ten days of life, and three for the third. An observant mother or nurse can by this time arrive at an intelligent idea of the natural appetite of the child, which should be gratified as long as digestion is good.

Intervals of feeding should be at first every two hours for the first twenty days, and from then until the sixth month every three hours will usually be a convenient interval. After the sixth month every four hours is usually often enough, while at the eighth month every six hours will usually suffice, if the child has a good appetite for each meal.

Constipation is often observed in infants, and is an exceedingly disagreeable and, at times, injurious complication. It frequently results from the fact that the child obtains but an insufficient amount of water. In other cases the meconium persists after birth, and the functions of digestion are slowly established. Where the child is obstinately constipated it is well to employ oatmeal-water in place of that used in diluting the milk. The addition to milk of dry extract of malt proves efficacious in many cases.

Oatmeal should be used in the form of dilute gruel, and this is to be made by thoroughly boiling a coffee-cupful of oatmeal in a pint of water, straining it through coarse cheesecloth, and sweetening it with milk-sugar. Extract of malt may be used in place of oatmeal, by adding to each eight ounces of the child's food from one-half of an ounce to an ounce.

Massage of the abdomen, pressure being made along the large intestine, is often of value. The wearing of an abdominal binder of flannel is also useful in many cases. Five grains of sodium phosphate may be added to an eight-ounce bottle of milk and cream, and its use continued for several weeks. Aromatic cascara sagrada is of service in these cases, a dose for a child one month old being ten drops night and morning, and, if necessary, twenty drops night and morning until a decided effect is produced. When this results the dose may be lessened until it is ascertained what is actually required.

Observation will often determine which constituent of the food is in excess or deficient, and when this is remedied digestion is better performed. In many cases olive oil may be taken to advantage, from one-half a teaspoonful to one or two taken daily or several times a day. As soon as the child is old enough to leave an exclusively milk

diet broths and soups may be prepared, the stock of which contains the extractive matter of various vegetables. Orange-juice in season is often useful in these cases. The juice of stewed prunes, apple-sauce, change of air from the city to the country, will sometimes cure this distressing complication.

When the bowels refuse to act in an infant care must be taken that the lower bowel is emptied mechanically at frequent intervals. One of the least harmful of these measures consists in the injection of warmed olive oil into the rectum; soap suppositories and gluten suppositories are often valuable in these cases. Injection of glycerin is too irritating for infants, as a rule. Injections of tepid or cold water, with or without soapsuds, are indicated in many cases, and will often assist in removing a condition of jaundice. As children obtain teeth, whole-wheat bread soaked in milk or broth, grated or stewed apple, or oat-meal gruel or fine hominy, are useful in these cases. It is especially important that the nurse who has charge of the infant should practise massage of the intestine intelligently each morning. An obstinate habit of constipation may often be avoided in this way.

The influence of habit in avoiding constipation with children is very important. The child should be taught to make the effort to have its bowels moved at a regular time each day, and, if it be placed upon a suitable vessel at that time, it will soon learn to make the effort for itself. Such training may begin when the child is a few months old, and with well-developed children the rapid formation of a regular habit is often remarkable.

CHAPTER VII.

ABNORMALITIES IN THE SIZE AND FORM OF THE FŒTUS. MONSTROSITIES.

Variations in size, without abnormalities in form, have been noted in the cases of children born of excessively large or very small parents. Children weighing more than twenty pounds have been observed, although very rarely. It is very seldom that the obstetrician will meet with a fœtus weighing more than ten pounds, while the cases in which the fœtus exceeds the average in weight are by no means uncommon. Dwarf children are occasionally observed who are perfect in form, but of diminutive size. They present no other abnormality, except a feebleness in strength and often a deficiency in nervous force.

The causes which lead to the birth of excessively large or abnormally small children must be sought, first of all, in the stature and development of the parents. Large children are born of large parents, while occasionally it is observed that parents of average stature may have a child so deficient in size as to be practically a dwarf. No cause is found in most of these cases for the small size of the offspring.

The obstetrician will often have occasion to notice the progressive increase in the size of the fœtus in repeated pregnancy. In estimating the prognosis of labor this factor must be taken into account. If, on inquiry, it is found that preceding labors have been difficult because the child was above the average size, there is every reason to expect in subsequent labor a similar complication. When palpation reveals the existence of a large fœtus at the full period of viability it is better to induce labor than to expose the patient to the risks of another difficult labor with a very large child. In many of these cases it is found that excessive appetite on the part of the mother during pregnancy is followed by corresponding development on the part of the fœtus. The belief has long been current that a diet rich in meat, and especially in beef and in articles of food containing earthy salts, produces very large children. In cases of excessive appetite on the part of the mother, or where she has already borne very large children, it is well to limit her food by the exclusion of the heavier meats by substituting milk, fruit, and bread for other less easily digested food. It is quite possible to nourish such a patient well, and at the same time to avoid the dangers and inconveniences arising from the excessive size of the fœtus attendant upon an abnormal consumption of the heavier foods.

In estimating the size of the fœtus before birth palpation is the most practical method available. The length of the fœtus may also be measured through the abdominal wall, or by introducing one pole of the pelvimeter within the cervix, while the other is over the fundus of the uterus. In estimating the size of the fœtal head care must be taken that the presence of fœtal intrauterine disease, such as rhachitis, does not mislead the examiner. A rhachitic skull within the uterus may be mistaken for the head of an abnormally large child. A hydrocephalic skull may also occasion error in diagnosis.

In making a prognosis as to the course and mechanism of labor it would be of advantage to the obstetrician could he foretell something regarding the shape of the fœtal cranium. If either or both of the parents present marked abnormality in this respect, it is reasonable to suppose that the shape of the fœtus may be modified by this circumstance. Marked peculiarities in the contour of the head in grandparents have also been reproduced in the fœtus. While cases of this sort have been observed, still the number is not sufficiently great, nor can the relation of cause and effect be traced sufficiently clearly to enable the obstetrician to foretell the shape and contour of the fœtal skull.

Several causes working independently or together may produce malformations in the fœtus. The causes of this condition have been studied not only by observation upon the human being, but also by experiment upon other organisms. It is most natural to suppose that abnormalities in the elements which form the embryo, or in their manner of union, may produce such a result. The ova of certain female fish have been found to be especially apt to produce malformed young without reference to the source of impregnation. It has also been observed that certain women have repeatedly given birth to monstrosities. Experimental and clinical observation seem to show that the ova are responsible for these conditions.

From the study of the manner in which the ovum undergoes division it is evident that mechanical impressions may greatly alter the course of development in the embryo. The position or equilibrium of the ovum may be altered or direct violence may be done. Experiment has shown that if the egg be inverted so that its germinal portion is placed in an abnormal position, a malformation will result. If eggs are subjected to similar treatment during incubation, chicks so born show distinct evidences of the abnormal position of the egg. It is curious to observe that the largest portion of the chick is that developing from that portion of the ovum which was lowest in the egg. Partial inversion of the viscera has been caused by keeping the germinal area beneath the yolk.

Violent disturbance of the impregnated egg has also caused the formation of monsters. This has been repeatedly proved by observing eggs which have been subjected to violence in transit, or which were purposely rotated during the process of incubation.

Direct mutilation of the ovum has resulted in the production of marked abnormalities in the development of the embryo. Injuries to the amnion, by direct violence or the application of the cautery, have been partially successful in producing monsters. For the perfect development of the fœtus it has been found that a temperature of from 41° to 42° C. is requisite. When heat was lost, development was retarded, and was not resumed until the temperature was restored. Equally interesting are the results of experiments in preventing the entrance of oxygen into the egg by rendering the shell impervious. When this is done variations in the shape and development of the fœtus are observed.

While no exact relation has been observed between the sort of interference practised with the ovum and the resulting type of abnormality or malformation, still the general principle remains established. From this experimental knowledge we can well understand how disturbances in the mother's economy, or radical changes in her environment, may react injuriously upon the development of the embryo. It naturally follows that to obtain the best development for the fœtus the mother must be undisturbed by either physical violence or nervous shock; that she should not be exposed to extremes of temperature, while an abundant supply of oxygen must be afforded her, and care be taken that nothing interferes with the mechanism of respiration.

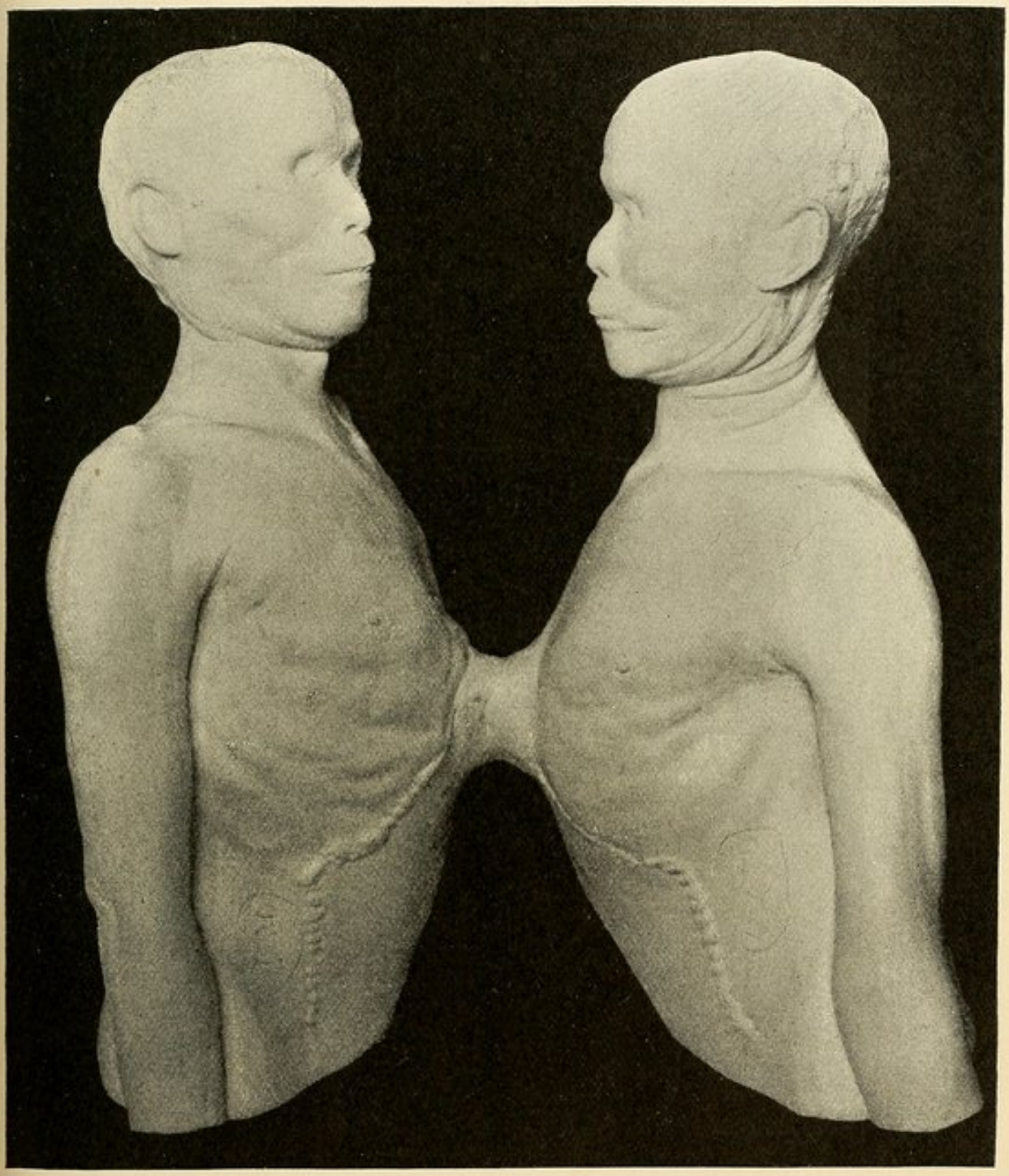
In classifying abnormalities in the development of the human being Saint Hilaire's is adopted by the greater number of writers upon the subject. He places such abnormalities in one of four divisions:

Hemiteratic.
Heterotaxic.
Hermaphroditic.
Monstrous.

By hemiteratic are understood variations in volume, form, color, structure, position, number, and existence of the organs normally found in the body. It will be observed that while the fœtus may have the organs always found in the normal being, that these organs vary from the normal in some of the particulars mentioned. There will be present, however, in the individual no distinctly foreign arrangement of

structural elements, sufficiently differing from normal to cause the individual to be considered as a monster. Literally speaking, the hemi-

FIG. 215.

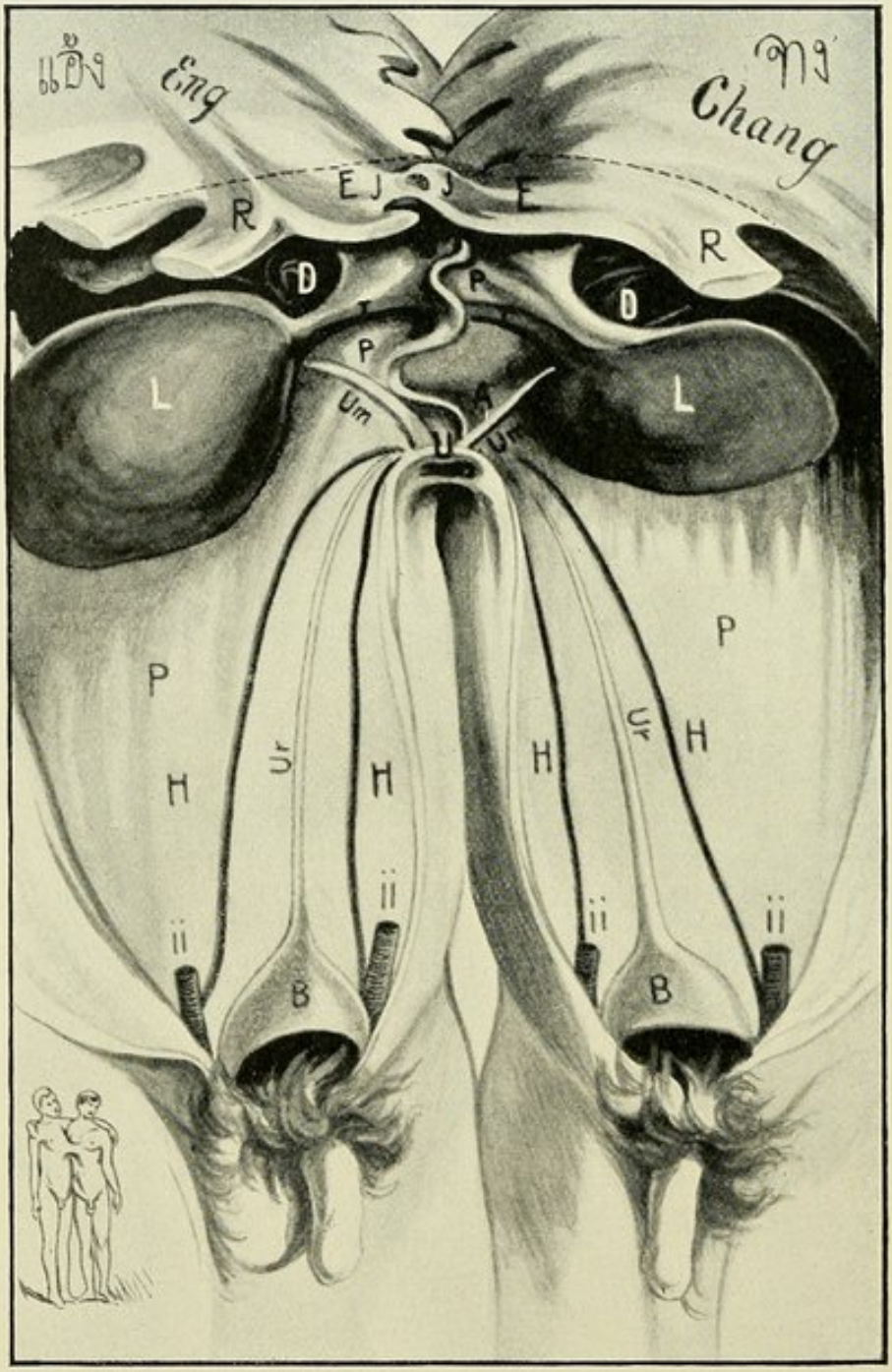


The Siamese twins.
Photograph of a cast in the Mütter Museum of the College of Physicians, Philadelphia.

teratic fœtus is remarkable for its close resemblance to the normal, while the monster may be so misshapen that it may be difficult to recognize the various organs of the body.

As examples not infrequently seen of this class of abnormality we have the dwarf, the giant, diminutive size of the breasts, or partial development of the vagina, or excessive size in the mammary glands,

FIG. 216.



Internal anatomy of the Siamese twins. (PANCOAST.)

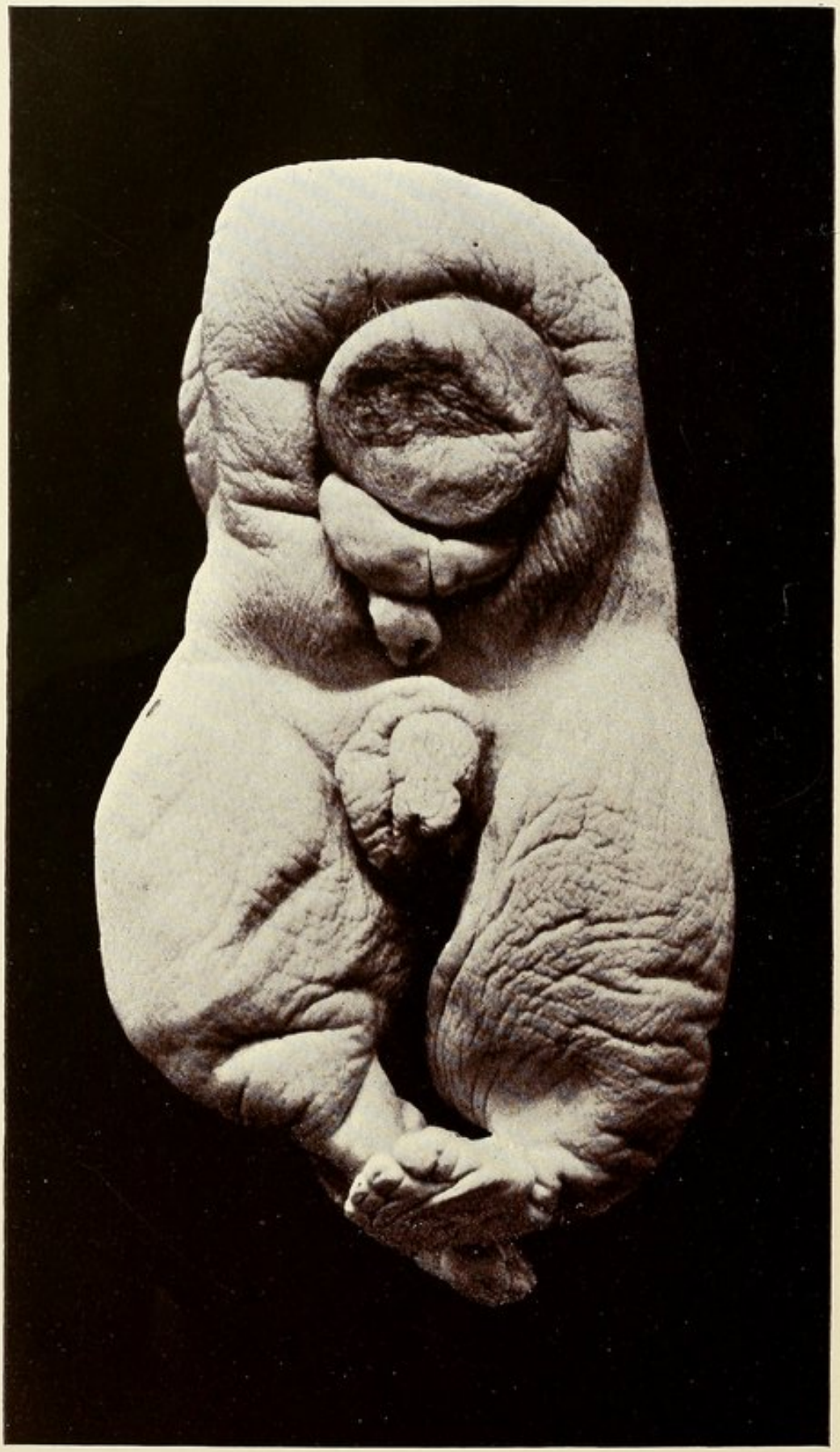
U. Umbilicus. H, H. Hypogastric arteries. Ur, Ur. Urachi. Um, Um. Umbilical veins. L, L. Liver. B, B. Bladder. ii, ii, ii, ii. Internal iliac arteries. P, P. Peritoneal pouches. A, B. Median septum of bond. F. Hepatic structure in bond. D. Diaphragm. E, E. Ensiform cartilages. J, J. Arthrodial joint of same. R, R. Lower costal margin of the thorax.

deformed pelves, albinism, lack of ossification in the skeleton, hernia or exstrophy of the bladder, abnormal occlusion of the rectum, vulva,

PLATE XXIX.

Phocomelus. (Hirst and Piersol.)

PLATE XXX.



Acephalus. (Hirst and Piersol.)

or vagina, complete closure of the vagina, harelip, cleft palate, the absence of a kidney or of the womb, or the presence of double uterus, or of additional digits. In all of these, however, the individual is not so misshapen as to fail of recognition, while the various organs of the body are capable of identification.

The heterotaxic fœtus shows, however, an abnormal arrangement of the various layers of germinal epithelium, which results in the transpositional abnormal arrangement of organs or groups of organs.

Under the head of hermaphrodite is designated a fœtus containing the reproductive organs of both sexes. While this condition is rarely perfect, still examples where each set of organs can be recognized are not uncommon.

Monsters are those examples of abnormal development which are so distorted as to present, in many cases, but little resemblance to the normal human being. They are either single or composite, as they are one distorted individual or the union of two. Single monsters are again distinguished as those capable of independent existence, termed autositic, and those which depend upon another embryo for nourishment, which is received at the umbilicus through the umbilical and placental vessels. Among the autositic monsters are commonly seen those which have imperfect limbs. They are known as ectromelus. Another common variety of this deformity is found in those monsters whose lower limbs are twisted or united wholly or partially together. Such are termed symelus. Other autositic monsters are those in which the body is variously deformed, while a considerable class of such monsters show varying degrees of failure in development of the cranium, the brain, and the organs of the special senses. (Plate XXIX.)

Omphalositic monsters show varying deformities of the head, the thoracic viscera, and the limbs, which make them incapable of living after the umbilical vessels are occluded. (Plate XXX.)

Composite monsters are formed by the union of two or more of the various sorts already described.

The diagnosis of the presence of an abnormal fœtus requires accurate observation and patient study in many cases. Occasionally the history of the patient's previous labor will call the attention of the physician to a possible repetition of some of the complications from which she is suffering. Thus, in a woman who has given birth to several abnormal children there is reason to fear a similar experience in subsequent pregnancy. Except in the case of very corpulent women, inspection of the shape of the abdomen will often call the attention of the physician to the condition present. He will, however, gain most valuable information by the practice of palpation, rendered possible, if necessary, by the assistance of anæsthesia. It is often needless to put these patients completely to sleep, but the inhalation of a small amount of bromide of ethyl or of chloroform will enable the physician to palpate the abdomen with ease. It must be remembered that a full bladder can greatly obscure diagnosis by palpation, and hence the catheter should be passed where it is not positively known that the bladder is empty. The physician's attention in external examination will be attracted by the irregular contour of the fœtus, and by the anomalous masses found within the

uterus. In cases of hydrocephalus the head cannot be made to engage at the pelvic brim, but can easily be moved from side to side, lodging against the brim of the pelvis. In cases where the cranial bones are deficient the converse may be true, and the ill-developed head may enter readily into the cavity of the pelvis. In cases where the limbs are absent or deficient, if the patient be a multigravida, it may have been noted that the fœtal movements are less active than normal. In joined monsters the contour of the uterus and the outline of its contents are so anomalous as to make an accurate diagnosis by palpation impossible.

Upon auscultation in cases of hydrocephalus where the head presents the heart-sounds will be heard at a higher level than normal. Should the breech present, the enlarged skull will force down the fœtal body, and heart-sounds will be heard at or below the umbilicus. In joined monsters the situation of the heart-sounds and their recognition are often determined with the greatest difficulty.

The course of labor, where the fœtus is abnormal in size and shape, varies with the deformity which it presents. The size and contour of the pelvis, the condition of the soft parts of the birth-canal, and the strength or weakness of the mother's uterus have much to do with determining the character of the labor. In cases where the child is greatly in excess of the capacity of the pelvis dilatation is exceedingly slow, because the failure of the presenting part to enter the pelvis removes one of the factors in opening the mouth of the womb. Should the membranes rupture, labor-pains are often strong and even excessive for a short time, when the uterus gradually passes into a condition of tetanus which threatens rupture. As the lower uterine segment becomes excessively thinned, the lower edge of the upper segment, called the contraction-ring, rises in the abdomen until it may be found midway or more between the umbilicus and the pubes. The uterus is hard to the touch, and pressure upon it causes great pain. The patient's temperature rises 1° or 2°, while her pulse increases to 100 or more, and exhaustion threatens. The occurrence of rhythmical uterine contractions ceases, the uterus remaining tightly contracted upon the fœtus. In cases where the head of the fœtus can enter the pelvis, but the obstacle to delivery is found in the fœtal body, the head may be born while the body remains within the womb.

Where joined monsters are present, each is rarely of excessive size. Like twins, each is smaller than the average fœtus, and hence it is possible for spontaneous delivery to take place, the birth of one fœtus occurring with the mechanism commonly styled spontaneous evolution. The first born of the two is usually expelled very much as in normal labor, while the second is born with an anomalous mechanism, the nature of which is determined by its peculiar shape, consistence, and attachment to its fellow. Where labor-pains are strong the abnormal fœtus is greatly compressed and distorted by its tedious and difficult birth. Many are stillborn from this cause.

In dealing with cases where the fœtus is excessive in size, if the patient comes under observation sufficiently early, palpation should be practised at intervals from the sixth month to the period of full

viability. When it is found difficult to bring the head of the fœtus to engage labor should be induced. When the fœtus occupies a breech presentation it should be turned by external version prior to the induction of labor. Where the case is first seen when the child is so large that the head cannot be made to enter the pelvis, the degree of disproportion should be estimated as carefully as possible, and the appropriate method of operative delivery should be chosen. If the patient will consent, she should be allowed to go to term, in the interests of the fœtus, as delivery by abdominal section is no more difficult at term than prematurely, while the child's chance of life will be much better. If, however, the patient will not wait until term, labor should be induced and the patient's natural resources tested, while the physician stands ready to interfere in any manner indicated.

In dealing with hydrocephalus patients must not be allowed to become exhausted by a tedious first stage of labor. Dilatation may be well hastened by elastic dilators, and, when complete, a portion of the fluid within the skull must be evacuated. While it is desirable to save the child's life, it must be remembered that hydrocephalus in many cases is accompanied with other defects of organism which render the life of the individual impossible, or, at best, most unfortunate. Defective development of the eye, ear, and other organs of sense is not infrequently present in these cases. This fact will naturally lead the physician to consult the mother's interests, with less regard to those of the fœtus, when dealing with cases where hydrocephalus is present. To evacuate the fluid from the skull a trocar and rubber tube are usually employed. An aspirator may be used, although much less convenient. In cases where delivery is imperative any sharp-pointed instrument may be thrust into the skull, followed by the finger of the operator. As the bones of the hydrocephalic skull are thin and flexible, the operator can readily enlarge the opening with his fingers. Puncture should preferably be made through a fontanelle, and as much fluid allowed to escape as possible. This may be followed by such a reduction in the size of the head as to permit the birth of the child by spontaneous delivery. Should this not be the case, the physician may attempt to deliver the head by thrusting his fingers into the opening and making traction in this manner. A much better and safer plan is to introduce the cranioclast deeply within the skull, and, grasping the head securely, to deliver it by gentle axis-traction. In cases of hydrocephalus in which the breech presents puncture may be made through the base of the skull, or the spinal canal may be opened.

Cases are sometimes seen in which a defective cranium is present with an abnormal development of the child's shoulders. The head is readily born in these cases, while the shoulders remain at the brim of the pelvis. To complete such a delivery the shoulders must first be rotated in one of the oblique diameters of the pelvic brim, and traction be made upon the lower shoulder by passing one or two fingers into the axilla. By pulling downward and backward, it is often possible to bring the lower shoulder well down upon the pelvic floor. When this is accomplished traction should be made in the other axilla, and the upper shoulder be brought beneath the pubes. The lower shoulder may then be delivered

over the pelvic floor, while the upper bears against the subpubic ligament. In accomplishing this delivery one or both of the clavicles may be fractured. The result is an immediate reduction in the size of the shoulders as the scapulæ fall forward toward the axillæ. Some operators prefer to anticipate this result by cutting one or both clavicles with strong, blunt-pointed scissors. In some cases this is accomplished without especial difficulty.

Fœtal tumors of the neck, chest, abdomen, and back may occasion difficulty in labor. Thus, a parasitic fœtus may be attached to its fellow in the sacral region, and, with the breech of the well-developed child, form a mass difficult to deliver. In these cases, if the obstruction be a fluid tumor, its contents must be evacuated, while, if it be solid, sufficient must be removed to permit delivery. It is absolutely necessary in these cases to employ complete anæsthesia, and to obtain full dilatation of the womb. Long-handled, blunt-pointed scissors are the safest instruments to employ, preceded and guarded by the fingers of the operator. For extracting severed portions of the fœtus long, blunt-pointed forceps are best adapted, while for removing masses of considerable size the cranioclast is most convenient.

In aiding the delivery of composite monsters traction by the fingers is usually sufficient. Decapitation, or any other form of embryotomy, should be employed whenever necessary. In performing decapitation the blunt hook and blunt-pointed scissors are the safest instruments.

The obstetric forceps is rarely available for delivery in these cases. Owing to the abnormal contour of the head the forceps cannot fit accurately upon the head, and hence a secure grasp cannot be obtained. In hydrocephalus the elasticity of the skull positively forbids the use of forceps.

SECTION VI.

DISEASES OF INFANCY.

CHAPTER I.

ACUTE DYSPEPSIA AND ENTERITIS.

Nervous children, or ill-developed and puny infants, not infrequently suffer from acute dyspepsia. The word dyspepsia signifies no more than difficult digestion, and is a term usually applied to purely functional disorder without necessarily structural change in the organs of digestion. In children who are not properly cared for, and especially who are not allowed to remain quiet after nursing, pain may develop soon after taking food, accompanied by vomiting of a sour and often curded milk, and by a general disturbance in the well-being of the child. In some instances the difficulty is found in the fact that the child receives a greater amount of fat or casein than its digestive power can manage. In others an abnormal secretion of gastric juice results in undue formation of acid in the stomach, with the rapid development of irritating fatty acids, followed by the complete or partial emptying of the stomach. In other cases the phenomenon is a purely nervous one, and no appreciable alteration in the secretion of the stomach can be observed. These cases do not often result from infection, although the lactic-acid bacterium may be found abundantly in the rejected food.

The matter expelled from the stomach should be examined with litmus-paper to test the presence or absence of strongly acid reaction. The habits of the child and of its caretakers should be investigated to ascertain whether the child remains sufficiently quiet after feeding. Sometimes a nervous and excitable nurse, by repeatedly handling the child, will keep up a habit of nervous indigestion which is very difficult to break. In these cases the child should be put in the hands of a quiet, orderly person who is careful to feed the child at exact intervals, putting it down after feeding in a comfortable posture, and allowing it to remain absolutely undisturbed. The quantity of food given should be lessened one-fourth to avoid a possible overtax of the digestive organs. Great difficulty is often experienced in securing a lessening of the food, because anxious friends and even the mother of the child may fear lest it should not receive sufficient nourishment. If the weather is suitable, the child may be placed in its carriage after feeding and taken into the fresh air, either to be kept still in the carriage or to be gently moved about, as the circumstances will permit. The administration of a small

amount of pepsin immediately after feeding is often of service to these patients.

Where strongly acid matter is vomited the condition can often be relieved by the administration of pepsin, or by using very dilute lactic acid immediately before eating. From three to five drops of dilute lactic acid may be given in a tablespoonful of water, slightly sweetened, if the child requires it. When dyspepsia occurs, with the ejection of strongly acid curd, the amount of milk and cream should be diminished until the condition becomes better. An increase in the amount of lime-water added to the infant's bottle is advantageous in some cases.

Aggravated cases of dyspepsia in young infants are sometimes seen in which the child is thrown into nervous paroxysms by the ingestion of food. In theses cases the administration of a sedative a half-hour before feeding will often relieve the difficulty. Bromide of sodium may be administered in doses of one grain to a child four months old, while with some children small doses of antipyrin, one-quarter of a grain to a child four months old, may be found useful. Children sometimes suffer from acute dyspepsia from the influence of cold or heat upon the nervous system. In these cases, if cold be at the bottom of the difficulty, the child should wear a flannel binder, while its clothing should be sufficiently increased by the addition of light flannel. The milk of the mother should always be examined in cases of acute dyspepsia to ascertain the presence of an excessive amount of fat or casein, or a marked diminution in either.

Enteritis in young infants is almost invariably caused by infection. In children who nurse, the breasts may be tuberculous or septic before the milk forms, and the establishment of lactation affords an opportunity for the passage of diseased germs from the mother to the child. In bottle-fed children, milk which is not properly sterilized, or infected water, readily conveys disease to the infant. It is often difficult to detect the precise germ which invades the intestines in a given case. The colon-bacillus has been found in the bowels of nursing-children, while other forms of micro-organisms have been isolated in great numbers. Poisonous ptomaïnes may also be contained in mother's or cow's milk, and their presence will cause infection of the intestinal tract.

The symptoms of enteritis in young infants are vomiting and purging, with a moderate elevation of temperature, irritation, and pain when the bowels move, a slightly distended abdomen, and a pulse of 110 or 120. The child is thirsty, and yet rejects nourishment when given by the mouth. The stools are green, sometimes being excessively liquid, and at other times resembling finely chopped spinach. The child is excessively irritable, constantly thirsty, and its thirst is very frequently mistaken by the nurse or mother for hunger. The tongue is somewhat furred and coated, and the child lies most of the time upon its back, with its thighs slightly flexed. The child takes the breast or the bottle greedily, but soon rejects its food through the intestine or from the mouth, with evidence of distress.

In some cases the stools, instead of being greenish, are grayish or dark brown, and in place of an acid odor there is an odor closely

resembling that of putrefaction. This is especially the case where ptomaïnes have been introduced through partially decomposed food. If such a case goes on unchecked, the lactic-acid bacterium, which may have been the first invader of the intestines, gives place to other and more active micro-organisms, the stools become serous or mucous, slightly tinged with blood, while muco-pus may be present in some cases. The child's abdomen becomes distended, its thirst increases, while its strength and weight rapidly diminish. Its face assumes a sunken appearance, its tongue is more heavily coated, while it frequently rejects its food, although taking water eagerly. The number of stools may become excessive, one every fifteen or twenty minutes, the child becomes apathetic, and finally lapses into a condition of partial coma. Symptoms of meningeal irritation may develop, and convulsions even may be noted before death.

In some cases the acute stage of the disorder seems to have passed. The child's bowel-movements diminish and become much better in character, its excessive thirst disappears, it even begins to take food, while its temperature falls from 102° or 103° to 100° F., or even less. Such a child, however, may develop within twenty-four hours a condition of coma, ending fatally.

If post-mortem examination be made in the case of children dying with acute enteritis, the mucous membrane of the intestine is found reddened and swollen, with the papillæ prominent. The large intestine is distended, and contains undigested milk and an abundance of bacteria. The contents of the intestine may be strongly acid from acetic, butyric, and lactic acids, or, if ptomaïne-poisoning has occurred, an alkaline reaction may be present. The bloodvessels of the mesentery and omentum are found injected in these cases, the kidneys are hyperæmic, the spleen is softer than normal, while hypostatic congestion is often observed at the bases of the lung. In cases which die comatose cerebral œdema is present, the ventricles of the brain being engorged with serum.

If the child has lived for several days, the heart-muscle will be found in a condition of acute cloudy swelling.

Some of these cases resist the first invasion of micro-organisms, and the diseased condition of the intestine becomes chronic. The infant has six, eight, or ten stools daily, containing partially digested milk, mucus, or muco-pus; the temperature is never very high, while the child rapidly fails, and finally dies from exhaustion. It becomes before death greatly emaciated, and there is often about the infant an almost cadaveric odor. Should the post-mortem examination of such an infant be made, the evidences of acute infection are present in but slight degree. The mucous membrane of the small intestine is pale and the muscular coat much wasted and thinned. The stomach is chronically distended, and atrophy of the mucous membrane has occurred. The large intestine is also distended, and is the seat of a slow, necrotic process, which rarely goes to the point of perforation. The lymphatic glands, however, of the mesentery and peritoneum are enlarged, while the muscular tissues of the body and its fat have been greatly absorbed. This process of atrophy sometimes goes to the extent of breaking down

the most resistant tissues of the body, as exemplified in perforation of the cornea, which occasionally occurs in the rapidly perforating ulcer of von Graefe.

The treatment of enteritis should be entirely based upon the fact that the disease is the result of infection. As milk is a favorable culture-medium for bacteria, it should be entirely withheld from the child. The infant should take an abundance of water in small but repeated doses, and this water should first be boiled. The gastro-intestinal tract should be thoroughly emptied, as rapidly and completely as possible, by the administration of antiseptic purgatives and by very free irrigation of the stomach and intestine. The child must be fed a small amount of highly concentrated nutriment which is free from bacteria. One of the most useful substances, because it is readily taken with water, is egg-albumin in the form of white-of-egg-water already described. If a child receives a teaspoonful of this every half-hour, it will obtain a considerable amount of nourishment, while its thirst will be greatly relieved. Chicken-broth can usually be retained, while beef-juice is often well borne. Alcohol in the form of brandy, five drops for a child three months old, and ten drops for a child six months old, should be given in a teaspoonful of water every hour or two. The best antiseptic purge is calomel, combined with sugar of milk or with bicarbonate of sodium. For an infant three months old one-twentieth of a grain of calomel, with one grain of sugar of milk or a half-grain of bicarbonate of sodium, may be given every half-hour until bile appears in the discharges. When two doses of calomel have been given, the action of the liver will be hastened by thoroughly irrigating the intestine with boiled water. If the temperature of the child be high, the temperature of the water used for irrigation should be less than that of the body in health, and a temperature of 90° F. is quite sufficient. If the child has vomited freely and the vomit has not contained mucus, it is not necessary to wash out the stomach. If, however, the stomach is distended and the child has not vomited, the stomach should be washed until the water returns entirely clear. A spice-plaster should be placed over the epigastrium, and the entire abdomen snugly bandaged with flannel. Heat should be applied to the extremities and to the occipital region, the child being very lightly covered, and, if the weather be hot, it should be placed in the coolest situation accessible and be sponged with tepid water and alcohol. Although many experiments have been made with antiseptic drugs, all are far inferior to intestinal irrigation. In desperate cases $\frac{1}{100}$ of a grain of strychnine and $\frac{1}{100}$ of digitaline are given by hypodermic injection every hour until the pulse improves; $\frac{1}{200}$ of atropine is often useful in these cases. The use of opium is not rational until the intestine has been thoroughly emptied. If the child is exceedingly restless and straining in the effort to empty the bowel, five drops of paregoric and five drops of brandy in a teaspoonful of water may be given every hour until the child is relieved. This treatment, however, should be used with great caution, lest the effect of the opiate be to increase the danger of cerebral œdema.

In chronic cases intestinal irrigation with antiseptics, as already described, is most useful. In chronic cases much may be done to increase

the child's nourishment by inunctions with olive oil. The hand of the nurse should be thoroughly warm, and the oil should be slightly warmed and mixed with oil two parts and alcohol one. The child should be gently but thoroughly rubbed, avoiding the abdomen or rubbing that portion of the body with great gentleness. A very considerable absorption will occur, and the child will gradually benefit from this procedure. Chronic cases are usually cured by a radical change of climate and surroundings. If such a child be taken to the seashore or to a considerable elevation in the country, its appetite and strength will begin to return in twenty-four to forty-eight hours. Life should never be despaired of, unless the process has gone so far that excessive muscular wasting and necrotic changes have occurred through the entire body. In hospitals where considerable numbers of these children are together strict antiseptic precautions must be observed with diapers and dressings. The crib, bedding, wards, and furniture must be kept surgically clean and thoroughly disinfected at frequent intervals.

A much less dangerous but obstinate form of enteritis is occasionally observed in children in favorable surroundings who have been fed for some time upon unclean, but not actively poisonous milk. In these cases the stools are not so frequent as to occasion alarm; the child partially digests its food, but gradually loses in weight and is exceedingly fretful. With such cases it is well to withhold milk for a week or ten days, nourishing the child by broths, beef-juice, egg-water, barley-water, barley-jelly, oatmeal-gruel, flour-ball, and finally restoring milk by a very gradual administration of Pasteurized and pancreatinized milk and cream. In these cases, in addition to intestinal irrigation, one-quarter to one-half of a drop of creosote, given twice or three times daily and well diluted, is often of considerable service. Where such children are in a cool climate, from ten to thirty drops of olive oil may be given three times daily with advantage. The following combination is especially useful in these cases:

Olive oil		2 parts.
Glycerin Yolk of raw egg	each	1 part.

Dose, from 20 drops to 1 teaspoonful two or three times daily.

Great care is requisite in gradually resuming the use of milk. This should always be Pasteurized and pancreatinized in accordance with methods already given. But one feeding of milk daily should first be tried, and, if this is well borne, the quantity and frequency should be gradually increased. Some children require a preparation of cereals, such as extract of malt or Mellin's food, to enable them to digest the milk. Convalescence is hastened in these cases by all measures which tend to increase the general strength. Sponging with hot water, massage with olive oil as described, and a good climate are requisite for a complete recovery.

CHAPTER II.

DENTITION.

THE appearance of teeth in the infant's mouth is significant as marking certain epochs in the development of the child. Dentition itself is of comparatively little importance to the infant, but the peculiar condition existing in its nervous and digestive organs, by reason of the stage of development of which dentition is a sign, has caused this phenomenon to receive undue importance at the hands of parents and of many physicians. It is certainly true that in perfectly normal children dentition passes through its various stages without exciting especial comment. The appearance of a tooth in a perfectly healthy infant is often a surprise to its parent or caretaker. During the stages of development which are accompanied by dentition the infant, however, is undergoing a development which renders it liable to reflex disorders, and hence this period of life is often thought to be inevitably accompanied by disease.

The germs of teeth are present in the fœtus within the jaw at birth. In children born at term they do not begin to approach the surface until the sixth or seventh month. The teeth appear in two sets, the mouth being divided in the median line into two halves, the teeth corresponding upon each side. The first teeth to appear are usually the central incisors upon the lower jaw; then come the upper central incisors; then develop the incisors next to these, above and below; then come the four anterior molars and four canine teeth; and, last, the posterior molars, two upon each side. At the end of the first year the incisor teeth have usually been cut. Their appearance is often preceded by very little if any local irritation, as the cutting-edge of the incisor teeth makes its way most readily through the periosteum and mucous membrane of the gum. Then ensues a period when the child is from twelve to eighteen months old, when the anterior molars are commonly developed. These teeth come with more difficulty in some children than do the incisors, because their edges are less efficient in cutting through opposed tissue, but their evolution is rarely in healthy children the cause of noticeable disturbance. From sixteen to eighteen months of age to the end of the second year, and sometimes later, the child is passing through the period of development which is commonly spoken of as the second summer. At this time the largest teeth of the first or temporary set are appearing, the child's digestive organs are undergoing considerable development, and, if this process occurs during the heated months, the heat predisposes to fermentation of the child's food and brings about a condition in which the development of disease may readily occur. Hence the popular fear that a child will do badly in its second summer. The last teeth to be cut, after sixteen or eighteen months, are the canines and the larger posterior molars. When these are well developed the child speedily passes beyond its first stage

of development, capable of taking a mixed diet, gradually acquiring the power of speech, being able to move independently, and passing from the stage of infancy to that of childhood.

Dentition should be considered, as has been said, as simply a clinical index for phases of development in the infant. The first teeth at seven months mark the time when the child's diet may be enlarged by the addition of semifluid food. Such, for example, is found in gruels, oatmeal, wheat, fine hominy, in the fatty material obtained by sucking a chicken-bone or chop-bone, by the pulp of ripe oranges, all of which substances in the healthy, robust infant will be digested and will improve the child's nutrition. If the mouth be inspected at this time, the gum in the upper and lower jaw will be found slightly prominent in the median line, slightly darker in color than normal, while the secretion of the mouth may be considerably increased. This often gives rise to the discharge of mucus and saliva, which is known as drooling. The child desires frequently to bite upon some smooth object, and is constantly putting articles within its reach within the mouth. In some children a slight intestinal catarrh develops, while others are somewhat constipated at this time. The appearance of a tooth is characterized by no especial phenomenon, and the edge of the tooth is often discovered, accidentally, protruding through the gum. In children at this stage of development, great care should be exercised that the mouth be kept clean. The finger of the nurse or mother should not be put into the mouth unless the hand has been first thoroughly cleansed. Physicians are often guilty of carelessness in thrusting dirty fingers into the mouths of children to examine the teeth. Those articles should be selected for the child's use which can be readily washed. Such are rubber rings, or smooth ivory rings, or playthings too large to go far into the mouth, but with perfectly smooth surfaces upon which the infant may bite. If the hyperæmia of the gum becomes excessive, the mouth should be sprayed with the following solution :

Powdered boric acid	grs. 20.
Glycerin	℥ ½.
Water to make 4 ounces.	

This will usually be found grateful to the infant, and tend to soothe any irritation which is present. A dilute solution of thymol, 1 : 3000, may also be employed.

From the seventh month to the end of the year the incisor teeth, as has been said, will appear at short intervals. During this stage of development, the child's diet may be varied, as has been said, while due attention must be given to the development of its muscular system. Free movements of every sort should be encouraged. The child's clothing should be perfectly loose, and it should be allowed to lie upon a bed, or, in summer, upon the floor, on a blanket, with as little clothing as is absolutely necessary upon it, so that it may move in the most free manner possible. The muscles of the back are well developed by placing a child upon a flat surface upon its stomach, when its efforts to raise its head and to raise the body from the surface on which it lies

are often very interesting to observe. The child's limbs are in constant motion, while it will develop the arms and muscles of the chest by pulling upon the side of its crib, in the effort to bring itself to a partially standing posture. In winter, and in draughty houses, it is not safe to put an infant at this age upon the floor. A suitable bed or crib should be selected, and a fence built around it in such a way that it will be impossible for the child to fall or to become caught in the surrounding railing. A frame or fence whose slats are close together may be made to fit upon the bed, the surfaces being carefully rounded and smoooth so that no points of roughness will be present. In hospitals, a hospital bed of the usual size may be enclosed by a railing, making an excellent exercise-ground for such infants. Massage should be practised daily by the nurse at the time of the bath, and a small amount of oil should be used at this time.

The care of the infant's skin during this period of development is of great importance. The child should be clothed in thin flannel, its abdomen protected by a thin flannel binder, its feet covered by knitted socks. In extremely hot weather all clothing may be removed from the child, and it may be placed upon a blanket upon a suitable bed, protected from a direct draught of air. If the child is vigorous, its daily bath may be a plunge in a rubber bath-tub or in a metal or porcelain tub. The temperature of the water should be 100° F., being cooled down, while friction is continued, to 80° or even 70°. The child should be first thoroughly washed with soap and hot water, and as the bath is cooled friction is employed, thus giving a distinctly tonic effect at the close of the bath. Such a bath is usually enjoyable to the child, and increases the circulation of blood in the skin. Massage may be given after the bath, or, if the child be restless, a warm sponge at night, followed by gentle massage with alcohol and olive oil, is often useful in promoting sleep.

The nervous disturbances sometimes met with in children at this period of development are best removed by the strict observance of quiet after feeding and a liberal supply of fresh air. The child's nursery and sleeping-rooms should have ventilators placed at the lower edge of the sash, giving entrance to air without draught. Wherever possible, an open fireplace should be in the play-room and sleeping-room of the child. In a changeable winter climate a child can be perfectly well who is not taken into the open air for the first winter after its birth. At certain hours of the day, when sunshine is brightest, the child should be suitably clad and taken in the arms of its nurse, or in its carriage, to a room exposed to sun, but not to wind, in which the windows are freely open. It may be kept in this room for one or two hours, and thus given the same exposure to external air without the dangers arising from dampness, and from many of the noxious materials which are found upon the surface of the ground in large cities. If this be done with regularity and fidelity, a child will thrive and its risks of contagion be very much diminished.

Each infant is entitled to its own crib in which to sleep. Under no circumstances should an infant sleep in bed with its mother or nurse, for many reasons. A mattress upon which the infant sleeps should be

of hair, its pillow low, its bedding light woollen blankets, without heavy spreads. A down coverlet, as so commonly used in Europe, is an excellent source of warmth, and is very light.

At the end of the first year of infant life the child should be capable of eating well-baked bread and simple, properly cooked meat; and if the child be vigorous, a little well-roasted and mealy potato, with butter and salt, may also be taken. The pulp of an orange, the soft part of stewed prunes, the pulp of a baked apple, will be found useful in promoting appetite and digestion. During the winter months many children are fond of syrup spread upon bread, and of this the best is molasses of the sort known as New Orleans or sugar-house molasses. This has a favorable laxative effect with many children. From the age of one year to the time when dentition is complete, from twenty-four to thirty months, the diet of the child should be gradually enlarged as its development proceeds. Broiled or boiled fish in season, the soft portions of oysters, chicken, mutton, and lamb, are the best solid food in the way of meats. Boiled rice, a limited amount of potato, spinach, stewed fruits, are most successful as an addition to the meats already mentioned. Light puddings, such as rice and cornstarch, may be taken in moderation. Bread should always be thoroughly baked, and may be softened by soaking it in milk, or may be taken with the dish-gravy of roasted meats. Milk and water are the only beverages allowed, an exception being made in the case of the lightest form of cocoa for hearty children in cold weather. In children deficient in weight and strength an abundance of good fat should be taken. Of animal fats, the fat of mutton and fish is best. Vegetable fats are best taken in some of the vegetable oils commonly sold under the name of olive oil. While it is difficult to obtain a pure sample of olive oil, still substances most often substituted for olive oil are frequently pure and harmless as articles of food. Such are principally cottonseed and peanut oil. While butter is usually relished by children, it is of less nutritive value than are the vegetable oils.

The second summer, or time of cutting the larger teeth, should be anticipated, if possible, by careful scrutiny of the child as this period approaches and by securing for it a proper climate. If this period of the child's life will come during the summer, it should be taken from the city early in the spring and given the advantages of the open air. The latter portion of winter is often a trying time for children, as infectious diseases are frequently epidemic at this portion of the year. Care should be taken that the child's digestion is kept in good order and that its nutrition is especially considered. In seeking a change of climate it must always be remembered that an infant will frequently do better in large rooms in his own home, where his surroundings can be controlled, than in small rooms at a hotel or boarding-house. Fortunately, at summer-resorts near the large cities there can usually be found suitable apartments where children can be properly cared for. Where families have summer residences the problem becomes, of course, much more simple.

The disorders of dentition, regarding which so much is frequently written, should be studied as complications of development rather than

as diseases immediately attendant upon the appearance of teeth. These may be conveniently considered under two heads: First, disease of the mouth occasioned by infection during dentition; and, then, other manifestations of the period of development and its abnormalities through which the child is passing. The first and most common disorder of the mouth during dentition is inflammation, or stomatitis, caused by infection.

In these cases it will be found that cleanliness has not been observed in caring for the child, but that infected fingers or articles have been in constant use with the infant. If the child is bottle-fed, the bottle and nipple have been dirty and surgically unclean. No attempt has been made to provide the child with clean and proper toys, and the result is seen in a red, swollen, and irritable condition of the gums which denotes the active presence of bacteria. Ulcers upon the mouth at various portions of the mucous membrane show an extension of the same process. These ulcers may be seen on the mucous membrane opposite the site of the coming tooth, or in those parts of the mouth where the finger of the nurse or attendant most frequently touches the mucous membrane. The presence of thrush often complicates this condition, and its white patches may be seen over various portions of the mouth, complicating the existing ulceration. The child's temperature is slightly elevated to 100° or 101° F., it is more than usually fretful and thirsty, and constantly endeavors to introduce into the mouth some substance which will relieve its disagreeable sensations. On the other hand, it is afraid of being touched, and the effort to examine the mouth is often strenuously resisted. If these cases are allowed to go on unchecked, ulceration may proceed to a considerable degree, the result being a chronic periostitis about the tooth, which may result in alveolar abscess. Bacteria are sometimes swallowed by such children, giving rise to an infection of the intestinal tract.

The treatment of these cases consists in removing sources of infection, by forbidding the introduction of soiled fingers and dirty toys within the mouth.

The use of a simple cleansing spray of boiled water, of boric acid and glycerin, as already described, is usually efficient. In some cases boiled water and sodium salicylate, five grains to the ounce, may be employed. With the removal of the exciting cause the difficulty usually disappears.

Attention must be called to a peculiar condition of the mouth due to infantile scurvy, which may be confounded with the appearance caused by the coming of teeth. In these cases it is often impossible to localize the condition in the mouth. The gums are red, soft, and dark and purplish, but this appearance cannot be referred to any one tooth or group of teeth. The gums may be so congested that oozing of blood follows contact, but ulceration is not always present. Inquiry will disclose the fact that the child has been fed upon highly sterilized milk, with the omission from its diet of fruit-juices for some time. The differential diagnosis is made by carefully ascertaining the general condition of the child and its method of feeding, and by observing the fact that the condition present is more a general, than a local, one in the mouth.

Aphthous stomatitis may appear during this period of development, and begins in the form of small, whitish spots or follicles, followed by an exudate and ulceration. This usually accompanies some derangement of the digestive tract, the child losing power to assimilate food and often suffering from constipation or diarrhœa. If neglected, the aphthous condition of the mouth speedily becomes a state of ulceration, and may persist for a considerable length of time.

In many children, especially those who are strong, very little constitutional disturbance follows the development of this condition. The pulse and temperature are very slightly disturbed, while digestion is so slightly interrupted that the caretakers of the child frequently ascribe its disturbed health to some temporary affection of the stomach or bowels. The diagnosis of this condition consists in observing its form of invasion, which is by the development of aphthous spots or follicles, followed by an exudate and then by superficial ulceration. It differs from infectious stomatitis in the fact that ulcer about the tooth rarely occurs, and it differs from diphtheria in its slight effect upon the child's general condition; and from the sore-mouth of scurvy by an absence of the dark color, soft, and almost bleeding condition of the affected gum. Strict cleanliness, with the plentiful use of sprays of dilute astringents and antiseptic solutions, with attention to the digestive organs, usually results in speedy cure.

The general disorders attacking the child at this period of development are, first, those which result from an increased secretion of the mucous membrane of the digestive tract. The increased formation of fluids in the mouth is accompanied by a gastro-intestinal catarrh, which, if aggravated by improper feeding, may eventually become a serious matter. The first symptoms of this condition are the presence of mucus in the child's evacuations, and the occurrence of diarrhœa or obstinate constipation. The constitutional disturbance of the child may be so slight as to be scarcely observed. If the child be closely watched, it will be seen that its appetite is either less or more than formerly, and that it may exhibit a lack of enjoyment in articles which had previously been favored sorts of food. Slight distention of the abdomen is present, and in some cases the child's bowels move within an hour after the taking of food, the movement being accompanied by straining and the expulsion of gas. The pathology of this condition is a simple hyperæmia, with increased secretion of the follicles of the mucous membrane from the stomach and intestine. As long as infection does not occur through the mouth, this condition may pass away without serious injury to the child. Should, however, through impure food, the intestinal tract become infected, a serious type of enteritis may develop.

The treatment of this condition calls for the careful revision of the child's diet. Milk should be strictly clean and pure; and unless this is positively the condition, milk should be Pasteurized. It is often well to omit one or two feedings of milk in these children, and to substitute beef-juice or chicken- and mutton-broth. The quantity of food may often be slightly diminished to advantage. If the child has been taking starches of any sort, the amount of starch taken may also be lessened with great advantage. If the child's tongue be furred and

coated, it may be given sufficient calomel to produce a free flow of bile, followed by the administration of castor oil to empty thoroughly and cleanse the intestinal tract. If the liver is not especially torpid, rhubarb, given in small doses for several days or a week, often brings about an excellent result. This may be used in powder in the following prescription, for a child eight months old:

Powdered rhubarb	gr. 1.
Sodium bicarbonate	grs. 6.
Aromatic powder	grs. 6.

In 12 powders: one to be taken two or three times daily with food.

In other cases irrigation of the intestine with normal saline solution, once daily for several days, is of great value. In cases where the condition is obstinate the administration of creosote in brandy and glycerin is often advantageous. The following formula for a child eight months old may be employed:

Beechwood creosote	3 drops.
Brandy	ʒ 2.
Simple elixir	ʒ 2.

Water to make 3 ounces.

A teaspoonful three times daily with food.

If such children have not worn flannel, the abdomen should be covered by a flannel binder, and, unless the weather is excessively hot, the entire body should be clad in woollen. The use of dilute mineral waters is often beneficial in infants who inherit a gouty, rheumatic tendency. Thus, lithia water may be taken by an infant of any age. Very light Vichy may also be employed to advantage. If a condition of simple gastro-intestinal catarrh be recognized and promptly treated, many cases of serious and obstinate enteritis can thus be averted.

An abnormal condition of the mucous membrane of the bronchial tubes is sometimes observed in children during dentition. If this be complicated by exposure to cold and damp, a catarrhal bronchitis may be set up which may proceed from the larger bronchi to the termination of the tubes, occasioning a serious complication. In well-nourished children who are suitably protected from cold and damp this rarely happens, and most of these cases terminate in spontaneous recovery after but slight illness.

The cavities of the skull connecting with the mouth are especially liable to catarrhal inflammation; should an abnormal condition of the gums arise during dentition. Catarrh of the Eustachian tube very frequently occurs, and the process may extend to the middle ear and inflammation and abscess be the result. Occasionally a similar process in the frontal sinus or in the antrum is seen in neglected and infected cases. In dealing with the ear-troubles complicating dentition the practitioner must remember that, unless the mouth has been infected, the Eustachian tube and middle ear are not in this case the seat of an active infectious process, but that poisonous bacteria may be absent from the mouth and ear. The greatest caution is necessary to avoid introducing from without septic matter into the ear. No object

should be thrust into the ear, syringing should not be employed, but the meatus should be thoroughly occluded with baked and sterile cotton. Round the edges of the meatus, where the discharge comes in contact with the skin, a simple, clean fat should be used to prevent excoriation of the integument. If this precaution be taken, simple abscess in the middle ear, with rupture of the drum-membrane, may discharge, and healing follow without impairment of hearing and with very little constitutional disturbance. If, on the other hand, by careless syringing or the introduction of various articles within the ear, the ear becomes actively infected, the most serious consequences may follow. Mastoid abscess and meningeal infection have been known to occur in these cases.

The occurrence of convulsions in children during dentition is not an unusual complication in ill-nourished infants with unstable nervous systems. The control of the convulsion is best effected by the inhalation of a small quantity of anæsthetic vapor, or by the immediate placing of the child in a hot bath, with cold affusions to the head. Sedatives in the form of hydrate of chloral, bromides, antipyrin, or codeia may be used in doses proportionate to the age of the child. The child should be thoroughly examined, to discover the point whence the reflex cerebral irritation has arisen. If the mouth be inspected and periosteum be found drawn tightly over the coming tooth, this membrane should be divided with a knife. If, however, no tooth can be found over which the gum is pressing, the lancing of the gums is not indicated and will do no good. Painful ulcers of the mouth should be touched with an escharotic, and then thoroughly cleansed with boric acid solution. The condition of the child's ears and nostrils, of its respiratory and digestive tract, should be thoroughly investigated, and very few cases are found which are not greatly improved by thoroughly emptying the intestinal canal. Male children should be examined to ascertain the presence of phimosis, and female children should be inspected to ascertain the presence of an irritating and inflamed condition of the vulva. Thorough examination of an infant who has a convulsion during dentition is quite as likely to find some other cause than a tooth for the convulsion, as to demonstrate that the cutting of teeth is the cause of the child's complication. While there can be no question of the relief afforded by freeing a tooth from compressing periosteum, it is also equally true that, unless the tooth is evidently held firmly back by this membrane, lancing of the gum is of no value. In cases where meningitis develops, following convulsions during dentition, it will be found that some other cause than tooth-cutting has brought about the meningitis. Thus, tubercular infection, septic infection from the ear, or a neglected injury to the head, will be found to account for most of these cases.

The nervous system in many children is much more susceptible of external irritation during the period of development when teeth are formed. A child becomes at times fretful and restless, and may try the patience of nurses and caretakers severely. At such times especial caution is necessary to give it an increased amount of fresh air. If the child sleeps poorly, it is well to avoid the use of drugs as long

as possible, and by bathing at bedtime, by selecting a quiet room, and by suitable clothing, to endeavor to secure sleep in this way. In children who suffer from constipation and from the formation of gas in the intestines, sleep is much promoted by the administration of an enema to empty the bowel at bedtime. If sedatives are necessary, the bromides of ammonium and sodium, or antipyrin given in one-half-grain doses for a child eight months to one year old, may be used for some time without injury. Opium should be avoided, if possible, while some children are greatly improved by the administration of alcoholic stimulants. It is much better, however, in the case of a restless child to give tonics and to increase the nutrition of the infant, rather than to trust to sedative and anodyne drugs.

CHAPTER III.

THE RESPIRATORY DISORDERS OF INFANCY.

CATARRH of the nasal passages in young infants may result from exposure to cold and damp, from the presence of an irritating substance in the nose, from abnormalities in the structure of the bones or tissue, from syphilis, or from some failure of nutrition, such as accompanies rhachitis. Cold-catching in infants commonly means that the nutrition of the child is bad, and that its care is deficient in that it is subjected to too great heat or is improperly clad. The keeping of infants in overheated rooms is a powerful factor in predisposing the child to nasal catarrh. Rooms heated by a furnace are especially bad, and no child should inhabit them if possible to avoid it. The open-fire of wood or coal, and the window-ventilator are special safeguards against cold-catching. Children who inherit gouty or rheumatic tendencies are especially predisposed to nasal catarrh, which is often obstinate, yielding only when attention is given to the child's diet and assimilation. Infants who inspire irritating dust suffer from nasal catarrh as a consequence, as is seen in children living in filthy surroundings, and exposed to the dust from rags or from other materials in which the parents may work. The nasal catarrh of the syphilitic child is the peculiar coryza seen so soon after birth and going on, if unchecked, to the production of a mucous patch or patches in the nostrils. Nasal catarrh in infants may also be brought about by the existence of a nasal polyp, which occludes the passage and maintains the mucous membrane of the nose in a state of chronic congestion and irritation. Hypertrophy of the turbinated bones or their membrane, enlargement of the tonsils, especially of the lingual tonsil, or congenital malformations in the bony structure of the air-passages, render this complication of childhood very much more frequent. The

children of tuberculous parents, unless carefully guarded, are very apt to develop a catarrhal condition of the nostrils.

The treatment of this complication consists in removing the cause. Nasal catarrh should not be allowed to persist in a child without having an examination made of the nasal passages, and an effort to determine the presence of malformation or enlargement of the tonsils or other portions of these tissues. Such abnormal conditions must be rectified by operative or other treatment. It must be remembered that in most of these cases malnutrition or malassimilation lies at the bottom of the trouble; hence such infants should be given small doses of Fowler's solution well diluted, cod-liver oil, or olive oil, or one of the most easily digested preparations of iron. In infants who inherit gout the diet of the child should be carefully regulated, while the child should take a considerable quantity of lithia water, which will often yield excellent results.

The local treatment of this condition consists in keeping the nares clean by sprays and douches of mild antiseptics or astringent materials. Thus, boric-acid solution, as already described, or dilute solution of alum, or normal saline solution may be used by the douche or by the spray. Such solutions should be warmed to blood-heat, and should never be given in such a manner as to cause suffering or great resistance on the part of the infant. Many children suffering from obstinate nasal catarrh improve only when taken into fresh air. In these cases, wherever practicable, a change of climate, if for only a short time, is especially beneficial.

Infants as well as adults suffer not infrequently from bronchitis. Exposure to cold and damp, neglect to keep a child properly covered, or exposure to a draught may bring about this condition. A sudden change of climate, especially a sudden removal to the seashore during a heated term, may result in this complication. The symptoms of this disorder in the infant are increased respiration to 30, 40, or 50; increased pulse-rate, 100 to 110; a moderate elevation of temperature, 101° or 102° F.; a cough, harsh in character, with derangement of appetite and digestion and temporary failure in strength. If auscultation be practised, no abnormal sounds are heard over the lower portions of the lungs, but over the large bronchial tubes the breath-sounds are very harsh and sometimes accompanied by harsh râles. In favorable cases the symptoms decline, the breath-sounds over the large tubes become softer, while the bases of the lungs remain unaffected. In unfavorable cases the symptoms are all aggravated, multiple small râles spread rapidly through the chest, and the respiration becomes exceedingly rapid, while the temperature rises.

The treatment of this condition consists in making mild counter-irritation over the bronchial tubes with a spice-plaster, friction with camphorated oil, or, what is better, a chest-pack may be made as follows: A piece of soft flannel is selected, long enough to pass completely around the child and lap over the breast. It is wrung out of water the temperature of the room in which the child is, and freely sprinkled with spirits of turpentine. It is then wrapped about the child, covering its chest as perfectly as possible. Over this is placed a

dry flannel, and both are left upon the chest until the first has become thoroughly dried from the heat of the child's body. To allay the cough small doses of paregoric or syrup of lettuce may be employed. Attention to the condition of the bowels is always necessary. The popular belief that a large dose of castor oil serves to check these cases has had many coincidences to prove the assertion. In children of good strength and intelligently cared for simple acute bronchitis of the large tubes yields readily to treatment, and the greater number of children recover. Where the cough is harsh the following combination, for a child eight months old, has proved successful:

Ammonium chloride		grs. 30.
Syrup of licorice }	each	ʒ 1.
Water }		

Teaspoonful for cough as often as needed.

By capillary bronchitis or catarrhal pneumonia is understood an extension of an infective or catarrhal inflammation from the larger bronchial tubes to the smaller and finer tubes. This process is often gradual in its development, while at other times it may suddenly bring the child into a very critical condition. Among the principal causes of this disorder may be reckoned simple bronchitis which has been neglected, contagious diseases, especially measles, a depressed condition of the general health and resisting power. The symptoms of this complication are very great acceleration in the respiration and pulse; the occurrence over varying areas of the chest of fine bubbling or crepitant râles. If the disorder comes on without interruption, a greater number of areas in the lungs will be involved. The terminations of the bronchi are often occluded by the abundant mucous secretion which is poured out, while some of the air vesicles have become collapsed because the terminations of the bronchi become occluded by the catarrhal secretion of the tubes. These portions of the lung collapse, and their function in respiration ceases to be performed. Percussion may detect little or no variation in the condition of the lung on account of the comparatively small areas involved. The congestion seldom endures long, the conditions changing very markedly within a few hours. Auscultation reveals the existence of fine râles which are scattered through the chest in varying number.

Rapid increase in the respiratory rate with rise of temperature tends to weaken the patient, while in unfavorable cases the secretion in the lungs may so greatly increase as speedily to occlude the air-vesicles, causing death by suffocation.

The treatment of capillary bronchitis or catarrhal pneumonia consists in making external applications of mild counter-irritants, to relieve the congestion which is present in these cases. As the great danger to the patient lies in heart-failure or in respiratory failure, the action of the heart must be watched early in the case.

Digitalis must be given in small doses, two drops of the tincture to a child eight months old every four hours until an effect is noted. One one-hundredth of a grain of strychnine may also be administered to advantage in weak and puny children. Small amounts of alcoholic

stimulants in the form of whiskey or brandy are indicated, while the child's food should be made as nutritious as possible, and the amount of milk offered to the child may be considerably diminished during such an attack.

An especial advantage is often obtained in these cases, where the temperature is high and where severe congestion threatens, by the use of a mustard-bath followed by the application to the chest of a turpentine-pack. The water for this bath should be 110° F. The child should be immersed to its neck, and sufficient mustard put in to cause the surface of the body to become thoroughly reddened. A cloth wrung out of cold water should be placed upon the child's head. The body of the child should be rubbed while in the bath, and the duration of the bath should be brief—not more than five or ten minutes. After the child has been removed and thoroughly dried, the turpentine-pack may be applied to the chest, and the child be allowed to remain in the pack until the flannel is dried from the heat of the child's body. If care be used in applying this method of treatment, it will not depress the child, but will render most valuable results.

The development of cyanosis is a dangerous symptom in these cases. The condition of asphyxia present is usually of the cyanotic sort, the child becoming a bluish, ashen color, while the pulse and temperature rise very considerably. This condition is to be met by an increase in stimulants, and by the prompt use of small, dry cups over the chest, or, what is better, the employment of the turpentine-pack. This disorder is exceedingly fatal in ill-nourished and weak infants, who are unable to resist its insidious development and profound depression.

Croupous pneumonia attacks infants less frequently than does catarrhal pneumonia or capillary bronchitis. The symptoms resemble those in the adult, while the sounds, on auscultation, are a tubular or bronchial breathing with râles, while percussion gives a considerable area of dulness. The temperature is 103° or 104° F.; the pulse 120; and respiration 50 to 70. If the child is vigorous, a favorable crisis may develop; but if the child be feeble, it will succumb.

The treatment of croupous pneumonia in young children consists of stimulation, the use of mild counter-irritants, and careful feeding. Excessively high temperature, 105° F. or over, calls for the prompt use of the cool or tepid bath or the application to the chest of the turpentine pack, which is usually of great value in these cases. The prognosis of croupous pneumonia must be very guarded, as heart-failure or respiratory failure is not infrequent.

Pleurisy may develop in infants from the same causes which produce it in the adult. It is, however, less common proportionately than in grown persons. It occurs usually as a complication in some form of pneumonia, or comes on very gradually and insidiously in catarrhal pneumonia of long duration in feeble and ill-nourished children. But a small amount of fluid may be present, and the symptoms may be masked for some time. In view of the difficulty often experienced in obtaining a positive sign of dulness in infants, recourse should be had, whenever possible, to aspiration, to make a positive diagnosis. A hypodermatic syringe is sufficiently large for this purpose. Such a

needle as is employed in injecting antitoxin will answer every purpose. In cases of tuberculosis in infants pleurisy very frequently develops and aspiration of fluid from the chest should be practised. If the indications are present, the chest should be drained by methods usually employed in the treatment of these cases.

By croup is understood a spasmodic contraction of the muscular fibres in the respiratory tract which is akin to asthma in the adult. The term membranous croup is but another description of a recognized condition, as it has so frequently obscured, by a false pathological conception, the diagnosis of diphtheria. Croup is most often seen in children who have, in the respiratory or digestive organs of the body, a constant abnormal condition. Thus, a child whose digestion is habitually disordered is subject to paroxysms of croup, whenever the gastric filaments of the pneumogastric nerve become greatly irritated. Croup sometimes occurs in children who are recovering from bronchitis, or where an epidemic of influenza or bronchial catarrh is present. Exposure to cold and dampness may bring about an attack of croup. The symptoms of this disorder are a peculiar crowing respiration, a harsh, strident cough, paroxysmal in character, with symptoms of asphyxia and prostration, gradually becoming more pronounced as the paroxysms increase in number and severity. These attacks frequently come on at night, the child waking from sleep to struggle in its efforts to breathe.

The treatment of this condition consists, first, in relieving the spasmodic state of the respiratory muscles by the inhalation of small quantities of anæsthetic vapor. Either bromide of ethyl or nitrite of amyl may be used by a physician with immediate relief to the patient. When this has been secured, counter-irritation should be applied over the chest and throat by wrapping up the chest of the child in flannel, wrung out of hot water and sprinkled with turpentine, spirits of camphor, or alcohol. If the child is robust and the temperature is elevated, cool water may be taken instead. The sources of the reflex irritation should next be sought and removed. An overloaded stomach must be emptied by a teaspoonful of syrup of ipecac, for a child eight months old, repeated every half-hour until free vomiting occurs. The intestines should be emptied by a copious irrigation of warm water. To prevent the recurrence of the spasm, bromide of ammonium may be prescribed with bromide of sodium in the following prescription, for a child eight months old:

Bromide of ammonium } Bromide of sodium }	each grs. 20.
Simple syrup	℥ ½.
Water to make 2 ounces.	

Teaspoonful every hour if needed.

For a robust child of eight months, chloral hydrate may be given as follows:

Hydrate of chloral	grs. 6.
Simple syrup	ʒ 2.
Water to make 1 ounce.	

Teaspoonful every hour or two until four doses have been taken.

As anæsthetics can rarely be used safely except by a physician, and as they are not always available, they are not employed so frequently in these cases as the conditions would indicate. The usual domestic reliance is upon some form of emetic, and ipecac is found in most nurseries. Ipecac and paregoric in small doses are often employed, the child of eight months receiving two drops of paregoric and ten of syrup of ipecac every half-hour for three or four doses, until the symptoms are relieved. It is better not to put opium in the hands of mothers and nurses unless the physician can be sure of the experience and discretion of the person who has charge of the child. Croupy children should be subjected to thorough examination, to ascertain the presence of any cause exciting a reflex spasm of the respiratory muscles. The digestive system must be kept in good order, and often a radical change of climate serves to bring about a complete cessation of the disorder. Such children must be given tonics and cod-liver oil or olive oil, and have a tepid sponge-bath daily. The tendency to croup seldom persists as the child grows older.

Asthma may develop in young children, with the customary paroxysms prevailing in the adult. It is sometimes seen in ill-nourished children, and is to be treated by the same methods employed for the relief of croup. Indeed, it is rare to observe in infants or young children asthma which can be distinguished from croup. A change of climate and all hygienic measures should be employed to build up such children, and overcome the tendency to a recurrence of the difficulty.

Influenza with croup may attack the mother and her infant, and seriously complicate the lives of one or both. The symptoms with the adult are those which are seen in other patients and require no special description. With influenza, pulmonary symptoms are often severe, with obstinate cough, resulting in gradual development of catarrhal pneumonia with frequently a fatal result to the infant. In treating these children, tendency to prostration so commonly seen in this disorder must be always kept in mind. Stimulants in the form of small doses of alcohol must be frequently given, while in severe cases strychnine must be employed if necessary by hypodermatic injections.

Sometimes infants manifest very marked symptoms of nervous derangement in these cases, in loss of sleep and great restlessness. Such patients must be treated by the use of paregoric with alcohol, by sponging with alcohol and water at night, and by persistent and very careful feeding. While influenza itself not very commonly attacks infants in its severe form, it is among the most dangerous and fatal complications of infancy. Its after-effects are often seen in a catarrhal inflammation of the middle ear, or in an obstinate naso-bronchial catarrh which may persist for several months. The treatment of this condition from the first should be largely tonic and stimulant, and the patient must be carefully watched until the child has completely recovered.

CHAPTER IV.

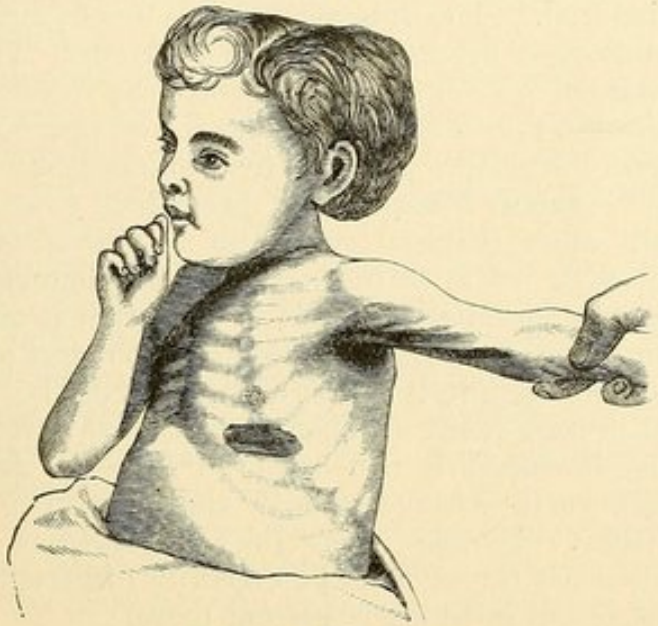
DISORDERS OF DEVELOPMENT IN INFANCY.

The infant is subject to various abnormalities in its development which, while not acute diseases, serve to increase very seriously its ultimate rate of mortality. One of the most common is rickets or rhachitis.

In many cases this begins before the birth of the infant, and seems to be an hereditary taint derived from either one or both parents. In these cases the cranium of the child seems especially to be affected, and the wide parietal portion of the skull, the overhanging forehead, and the thick wall of the cranium give evidence of the presence of this disorder. The occurrence of intrauterine rickets may be inferred when the mother shows signs of the disease, and when the skull of the child by palpation is evidently larger and heavier than normal. The presence of rhachitis in the infant *in utero* may very seriously complicate labor, especially in contracted pelves, by greatly increasing the disproportion between the head and the pelvis. This must also be taken into account in selecting a method of delivery in a rhachitic pelvis. It is but reasonable to suppose that, if the mother is rhachitic, the child will also share her malady. As far as the treatment of this condition goes, before the birth of the infant but little can be done, except to keep the mother in the best possible condition. The intestinal tract of the mother should be properly emptied; she should have nourishing diet and plenty of fresh air. The question of the induction of labor should be raised as soon as a diagnosis of rhachitic pelvis is made, and, if the head cannot be made to enter the pelvis, pregnancy should be prolonged with a view of delivering an older and stronger fœtus by some appropriate form of operation. In inducing labor in these cases the operator must not be governed solely by the pelvic measurements of the mother, but must take also into account the probable abnormal size and condition of the fœtal skull. In delivering the rhachitic fœtus with forceps great difficulty is often experienced, since the head does not mould as does the normal cranium, while the increased biparietal diameter enlarges its size in precisely the direction where the greatest pressure may often occur. If version is made, the situation is not improved, as the enlarged skull is brought through the brim of the pelvis no more readily if the breech presents than if the cranium presents. It follows that, when the size of the fœtus is so great that the skull cannot be made to descend into the pelvis by pressure, the induction of labor, if the fœtus be rhachitic, will not improve the chance for mother and child, but, if anything, will greatly complicate the condition. A better result for both will be found in promoting the nutrition of the mother in the best possible manner, allowing her to go to term and then delivering her by abdominal section.

As the infant grows and develops, the characteristics of the rhachitic skull which are present in intrauterine life will be still more plainly developed. The broad parietal bones of the skull and the overhanging forehead leave no doubt as to the pathology of the condition. The prominent sternum, with the rhachitic rosary where the ribs join the sternum, the bent long bones of the extremities, and the enlarged terminations of these bones, assist in a diagnosis. Such children are generally deficient in power to assimilate, and bronchial and intestinal catarrh are frequent among them. Sweating of the head at night, delayed or irregular dentition, deficient development of some portions of the face, aid in completing the clinical picture. As growth proceeds the stature of the child may be deficient, while chronic catarrhal conditions of the intestine may lead to the decomposition of food and to a chronic distention of the bowel with gas. The female pelvis in

FIG. 217.



Rhachitic child. (SMITH.)

such children suffers the gradual failure of development which is familiar in the adult. The power of resistance to acute disease is lowered, and hence such children become a ready prey to tubercular and other infections.

The treatment of infantile rhachitis consists in the persistent and faithful employment of all those agencies which go to promote the nutrition of the child. The feeding of the infant must be of the best, and an especial effort made to induce it to assimilate considerable quantities of food. Phosphorus in the shape of the hypophosphites may be given, or cod-liver oil and olive oil are clearly indicated. Small doses of Fowler's solution long continued, alternating with the iodide of iron, may be used to advantage. Massage and passive movements will be of value in developing the muscles and tending to stop the curvature of the long bones. Salt bathing and a good climate and an open-air life will all conduce to a favorable issue. It must be remembered that

rhachitis tends to heal by the deposit of an abnormally large amount of bony tissue, deficient, however, in perfect organization. Hence such a child will be left, even should recovery ensue, with an unusually thick skull and with the characteristic enlargements in the skeleton. When this enlargement of the skull is but slight, it is not detected by the casual observer in adult life.

The lymphatic glands of the body often manifest abnormal conditions in infancy, which, while in some cases cannot be positively called disease, still vary greatly from the condition of health and predispose to acute disorders. One of the most common of these conditions is that of malnutrition, which was formerly termed scrofula. This loose and unscientific word was applied to all forms of chronic enlargement of the lymphatics for which no adequate cause was apparent. At the present time it has been well replaced by naming definitely the pathological condition which causes the glandular abnormality. In most cases enlarged lymphatics arise from the absorption of some form of infectious material. The tubercle-bacillus may gain access to the body and be destroyed by active lymphatic glands. These, however, may remain enlarged for some time. Tubercular infection often ends in glandular abscess, the bacillus perishing in the presence of pus-cocci which subsequently develop. In other cases enlargement of the lymphatics arises from constant absorption of ptomaïnes from the intestinal tract, while still other children show this condition caused by some focus of infection or irritation in the mouth. Whatever the cause be, enlargement of the lymphatic glands in an infant is always a serious matter. The intestinal tract should be studied to detect an abnormality in assimilation, and the intestine should be thoroughly disinfected and the diet revised in such cases. Where tuberculous infection is feared the patient must be carefully nourished, an excess of fat being given in the food, while small doses of creosote may be used to advantage for a considerable time. In cases where the lymphatics of the neck and jaws are enlarged the throat must be carefully inspected to see that no focus of irritation and infection is present there.

In patients where no apparent cause is found the child's nutrition should be put in the best possible condition. The blood should be examined microscopically, and the treatment based upon the form of anæmia which is present. If this condition be recognized early in infancy, and proper precautions be taken, a child may outgrow a state of threatened tubercular infection and finally develop into a healthy adult. Painstaking and constant care, however, is needed to secure this result.

Where glandular enlargement persists in spite of tonic treatment alterative substances may be applied to the glands with friction. Ichthyol is often used for this purpose in the following combination :

Ichthyol		grs. 10.
Oxide of zinc ointment Lanolin	each	ʒ 2.

To be rubbed thoroughly over an enlarged gland morning and night.

Where softening develops and where it is desirable to avoid a scar, if possible, the softened gland may be aspirated and pus withdrawn,

or a small opening may be made, the gland curetted with a small, sharp curette, the cavity washed with an antiseptic and packed with a narrow strip of gauze. If the packing be renewed for several days, the cavity will heal, and no extensive contraction of the tissues or scarring will result.

In some cases infants do not increase in weight and size normally, although they are not the subjects of any acute disease-process. In these infants it is often impossible to assign a rational cause for this abnormality, as the history of the child and its parents throws no light upon the condition. Sometimes the history of a severe nervous shock to the mother during pregnancy, or of a severe drain upon her strength, is obtained which seems rationally to account for the condition of the infant. As the child grows, it is usually observed that the development of the brain is also less than normal, in common with the impeded development of the body. Dentition may be delayed or may be irregular. Speech is acquired slowly and often imperfectly, while in some cases the emotions are unusually violent and in others seem to be considerably deficient. The size of the head in these patients is usually less than normal, the contour of the skull may be normal, or the forehead and centre of the skull may seem deficient in development. The child is slower in walking than is normal, and its general condition is that of good animal health, but of deficient stature and deficient nervous development.

But little can be done for these infants in the way of active medicinal treatment. If their powers of nutrition be preserved and carefully fostered, it is possible that slight improvement may take place until the child reaches the age where it may be sent to an appropriate school or asylum for the training of such children. Deficiency in the development of the skull has drawn attention to the modern operation of craniotomy or craniectomy, and cases are reported for this condition. While, theoretically, this procedure should give excellent results, its practical success has scarcely been sufficient to warrant great expectations from it. As such cases excite great grief among the parents and friends of the infant, everything possible should be done to ameliorate the condition.

CHAPTER V.

TUBERCULOSIS.

One of the most common and destructive of the disorders of infancy is tubercular infection. This may be received through the placenta before the birth of the child, or may be acquired through diseased food, or through the inspiration of tuberculous dust, or by the direct transference by the finger of an adult of tuberculous matter in sputum or tuberculous discharges. Intrauterine tubercular infection commonly proceeds sufficiently far to lead to a fatal issue within a short time after the child's birth. The seat of infection may be the respiratory or intestinal tract, and thence the bacilli may find their way to the meninges or the joints, or to the submucous and subserous tissues. Where infection occurs after birth, the respiratory and digestive systems offer the best entrance-point for the bacillus, and the development and migration of the germ coincide with the arrangement of the lymphatics in the affected part. Tubercular infection of the intestine may arise from the taking of infected milk from the mother or by consuming the milk of an infected animal. The symptoms of this disorder are diarrhœa of moderate severity; wasting, with loss of strength; gradually increasing swelling of the abdomen; fever at afternoon or evening, followed by sweating; failure of appetite and assimilation, with the gradual development of nervous symptoms which ultimately terminate in coma and death. Upon post-mortem examination the intestine may be found studded with tuberculous ulcers, while the retroperitoneal glands are enlarged. In other cases tubercular meningitis develops by the infection of the blood from the intestine. The child is fretful, its temperature persistently elevated, it is apathetic; symptoms of meningeal irritation show themselves in the turning of the eyes, the frequent cry, and the abnormal pupils, while coma or convulsion appears as the scene draws to its close.

Where the respiratory tract becomes infected the child will have fever, rapid respiration, and much roughened breathing, although râles may not be present Infants rarely survive long enough to form tuberculous cavities in the lungs, and hence the physician must not expect to find the physical signs of breaking down which are so significant in an adult. In these cases the retrobronchial glands are chronically enlarged, and may be the seat of tuberculous abscess.

Tuberculous infection of the joints is characterized by swelling, pain upon motion, elevation of temperature, and finally the appearance of redness, fluctuation, and, if no relief be afforded, rupture of the capsule of the joint and the discharge of pus. In many infants the tubercular process is so rapid that all of the great viscera become studded with tubercles before the formation of abscess. Thus, the lungs, the liver, the spleen, intestine, and the kidneys may show well-marked examples of parenchymatous tubercular infection. The cut surface of these

organs is firmer than normal, while tuberculous nodules can be distinctly seen studding the tissues. The pleuræ and the mesentery do not escape in these cases, while the pericardium may also be affected.

Acute tubercular infection in infants can rarely be successfully combated. Should the infection become localized in a single gland or in a joint, if the child's resisting-power be good, the bacilli may be destroyed by suppuration, when emptying of the abscess may result in recovery. Parenchymatous tuberculosis, however, is uninfluenced by treatment. Much, however, can be done to palliate and make more comfortable these patients. If fever be excessive, the infant may be sponged or even packed. Alcohol is a great comfort in such cases, and should be administered frequently in small doses. Where pain is a prominent feature, paregoric or codeia may be employed to advantage. Collections of pus must be evacuated as promptly as possible. Change of climate may bring about a temporary alleviation, which is usually, however, deceptive and results in disappointment. Should the process become stayed and recovery ensue, the child will retain a damaged power of resistance, while its assimilation and general processes of nutrition will usually be deficient.

SECTION VII.

THE JURISPRUDENCE OF OBSTETRICS.

CHAPTER I.

LEGITIMACY OF BIRTH.

THE question of the duration of normal pregnancy is frequently of great importance when the inheritance of property, or the succession to a title depends upon the determination of the legitimacy of offspring. Authorities agree that it is impossible to state the exact duration of pregnancy. This is so because it can rarely, if ever, be ascertained whether conception results from the impregnation of an ovum formed at the preceding menstrual period, or whether an ovum discharged during or after cohabitation has become impregnated. Menstruation and ovulation may occur independently, and another factor contributing to the uncertainty of the problem is found in the varying life of the spermatozoids after their entrance into the body of the mother. Various authorities state that pregnancy with viability may vary from 240 to 300 days, and there is abundant evidence in recorded cases to prove the variability of the periods of gestation.

Many instances occur in practice in which the closest calculation on the part of women who have borne children leads to the determination of a certain date for an approaching confinement, where pregnancy has been observed to go from two to three weeks beyond this period. Three-hundred-day gestation has been observed on several occasions by the writer.

On the other hand, favorable conditions in the development and nutrition of the mother may produce a child, born at seven or eight months, vigorous enough to thrive, and comparing favorably with other less favored children born at nine and one-half months. Where skilled care is given to the infant, it must be remembered that modern methods of treatment have extended the period of viability in rare cases to six months, and in a considerable number to six and one-half. While various codes of law prescribe different periods at which the child may be thought viable, the practitioner must remember that viability depends more upon the development of the fœtus than upon its uterine life during seven or eight or nine months. The dimensions of the average infant at term have been already given, and also its weight. From six and one-half to seven pounds is the average weight at term. In addition to the dimensions stated, it must be remembered that corroborative evidence of the viability of a child is found in the color of the skin, the prominence of the cranial bones, the growth of hair upon

the head, the nails, the condition of the genital organs, and the degree of ossification present in the femur. The size of the infant at the various months of gestation has been already given.

In determining the parentage of a given child the resemblance of the child to those claiming to be its parents must be carefully considered. This resemblance may be in the form of a likeness in the features, or a family resemblance existing in former generations may be reproduced in the most recent offspring. Thus, the infant may resemble its grandparents, or it may have some anatomical deformity which is known to occur in that especial family. It has been found by experience that the portion of the body most reliable for its identification is the ear. It is impossible to disguise the ear, and hence police authorities are accustomed to rely upon this fact very largely for positive identification.

In some families a slight peculiarity in the structure or curves of the ear may be present, reappearing at various generations, sometimes remaining absent for a generation. If such a family peculiarity be present, it would furnish evidence of value that the child in a given case was a member of that particular family.

Another means of identification lies in the transmission of birthmarks from parent to child, and especially from mother to child. This may be in the form of an angioma, or, if the mother gives a history of having been frightened, a mark upon the fœtus may in some way reproduce the source of her alarm. It has been claimed that boys resemble most the mother and girls the father, and in estimating this resemblance the predominant influence of the father in determining the stature of the child should not be lost sight of.

Cases are occasionally met with in which, to secure an inheritance, an endeavor is made to substitute a child and thus to deceive the father or the courts. In these cases the infant must be carefully scrutinized to determine positively that it is exactly at that period of life which the alleged child must have reached. Thus, a child several days old may be procured to personate a newborn babe, and in this case examination of the umbilical cord would detect the fact that the child was several days older than was alleged. The process of mummification in the cord would naturally be much further advanced than in the newborn infant. The discharges from the intestines would also be valuable in determining the age of an infant, as it is well known that the meconium does not persist but a few days in the healthy child. Newborn infants frequently show uric-acid crystals in the urine, which stain the diaper a pinkish or reddish color. After the first few days of life these disappear, and the urine becomes clear. A newborn child frequently does not suck with especial greed or activity, while the child several days or a week old has fully learned to obtain food from the breast. The newborn child loses weight for a few days after birth, while the child several days advanced may have begun to make good its loss. By carefully observing the child which is supposed to have been substituted a physician will usually be able to determine that it is or is not the offspring of the alleged parent.

CHAPTER II.

INFANTICIDE.

In cases of fœtal death the physician may be called upon to determine the cause of death in a given infant, and especially the possibility of infanticide. In dealing with these cases it is first necessary to decide positively that the fœtus was sufficiently developed to have survived. This must be done by ascertaining its dimensions, and by taking the evidence which presents of the stage of its development. When it has been decided that the child was born at the period of viability it must next be examined to ascertain whether any complication occurring during birth would have been sufficient to cause its death. If the infant is seen a very short time after birth, symptoms of asphyxia arising during labor may first be present. Such would be a peculiar bluish pallor of the skin, an absolutely flaccid condition of the muscles, rigor mortis being completely absent. Evidence of severe birth-pressure would be presented by a greatly compressed and distorted skull, with an excessively large caput succedaneum, and especially if the infant were found with the cord tightly coiled about any portion of its body. If these conditions were present, a diagnosis of death from birth-asphyxia would be justifiable.

Rigor mortis may occasionally begin *in utero* and persist for some time after delivery, so that its presence or absence is no conclusive sign that the child ever lived outside the mother's womb. Positive evidence that the child was stillborn is obtained by the presence of maceration in the skin of the infant. This begins upon the outer surface of the body in the form of blisters or blebs, the epithelium being first separated and fluid accumulating within the blisters. This is followed by necrosis of the skin and of the internal organs of the body. If maceration be positively present, it is a sure sign of fœtal death *in utero*.

When no evidence of intrauterine death exists the physician naturally turns to the inquiry as to whether positive evidence is present that the child ever began to assume the necessary functions of life. As the establishment of respiration marks the change from life in the womb to life outside the mother's body, the natural question occurs whether or not the child has ever breathed. In attempting to determine this point it must be remembered that some of the efforts for artificial respiration succeed in forcing air into a considerable portion of the infant's chest. Such especially is Schultze's method. This, however, rarely produces a complete inflation of the chest, as the infant's lungs are not completely expanded for several days after birth. To determine the question as to whether the child has ever lived, the heart must be examined to ascertain whether the foramen ovale has closed. This is brought together within a very short time. If air were found in the lungs of a child while the foramen ovale was not closed, the

inference would be that air had gained access by some method of artificial respiration, but that the child's heart had not continued to beat after the separation of the infant from the body of the mother. If, on the other hand, air were found present in a considerable portion of the lungs and the foramen ovale were closed, there would be very strong grounds for belief that the infant had survived its birth.

A more exact method of determining the condition of the infant's lungs consists in subjecting them to microscopic examination. If this be done and the bronchial tubes be found expanded, the walls of their terminal portions being no longer in contact, evidence that the infant had breathed would thus be presented. The condition of the epigastric arteries would also be of value in such a case.

Positive evidence of infanticide must be sought for in some mark upon the child's body, or some abnormality of its cord or placenta indicating that the conditions for its life had been interfered with. Infants are more frequently killed by smothering or choking. If the latter has been the method of procedure, contusions upon the child's neck or about its face and nostrils will usually be present. Thus, evidence usually appears in the shape of finger-marks or marks of injury to the mouth. When finger-marks are present, the child has been strangled by direct pressure upon the trachea. In some cases the child has been overlain by the mother and smothered, and in such no sign of contusion is present upon the child's throat. A child is often smothered by pressing a handkerchief or napkin into the mouth, and in these children careful examination will detect the presence of bruising or laceration of the mucous membrane, which can be shown to have resulted from injury, and not to have followed any process of disease.

It is often impossible to determine that an infant has died as the result of direct violence. Cases are sometimes seen where a child has been born living, but where it has purposely been allowed by the mother to fall for a considerable distance, producing fatal injury to the skull. In these cases the scalp is bruised over a given area, and, if the skull be carefully examined, the bone will be found to be completely or partially fractured. Complete or partial fracture of the clavicles, and occasionally of the humerus, may also be present after difficult labor. If a child has been allowed to fall or has been thrown upon the ground, bits of dirt or grass may be adherent to the scalp at the time of examination. In cases where children have been thrown into cesspools the filth of the pool is found upon some portion of the child's body.

In children born while the mother is in the upright posture the cord may be torn and the child perish from hemorrhage. Upon examining the cord its external sheath will be found to have parted at a different level from the point of fracture of the vessels, thus forming a sort of flap or sheath over them. This accident is not invariably fatal, as it is possible for the cord to rupture without the death of the fœtus. Where, however, the cord is cut and is not tied, the child rapidly perishes from hemorrhage.

It is often difficult to determine, in cases of difficult labor where the patient has been assisted in the childbirth, the exact part played in fœtal

death by the manipulation of the physician. Thus, in difficult version and extraction through contracted pelvis the child may be born with a fractured skull, which might have been avoided had symphysiotomy or Cæsarean section been done. Fruitless attempts to deliver with forceps through contracted pelves cause fracture of the skull, laceration of the scalp, and fatal injury.

The humerus is not infrequently broken in such cases, while the clavicle may be fractured either unintentionally or purposely in the delivery of the child. The scalp is occasionally torn by unskilful application of the forceps. If the case be carefully reviewed, and the condition of the mother before birth of her child be ascertained, it may be found that the cause of infantile death rests entirely with the medical attendant. Modern obstetric surgery has removed the necessity for these casualties. Some of the most pronounced cases of injury of the fœtus occur in the practice of ignorant midwives, who attempt to pull the child, when presented by the breech, from the body of the mother in utter ignorance of the condition present.

Newborn children are rarely killed by the administration of drugs or poisons. In cases of criminal infanticide the mother usually has no drugs. Occasionally bits of any convenient substance are placed in the child's mouth. These are inspired into the trachea and suffocation results. The evidences of drowning in the infant are the same as those in the adult, if the fœtus has lived and breathed.

CHAPTER III.

ABORTION.

One of the most frequent medico-legal questions coming before the physician is the determination of the presence or absence of a criminal element in a case of abortion. By the term we understand the expulsion of the ovum before the period of viability. This may be brought about purposely by the mother in one of three usual ways: First, by actions upon her part which are intended to secure the expulsion of the ovum, but which do not include any manipulation of the uterus. The first of these is the familiar expedient of women illegitimately pregnant, which consists in lacing so tightly as to force the uterus downward and seriously prevent the development of the fœtus. Only those physicians who see large numbers of such cases can appreciate and believe the degree of fœtal injury which can arise from this action. The development of the child is so greatly interfered with that it may be able to survive but a moment after birth. It is deficient in weight and in vigor, although the skeleton seems least influenced by this condition. The uterus of the mother may be carried so forcibly

downward into the pelvis that considerable mechanical injury may be done to the cervix and lower uterine segment. The tissues have been found bruised and infiltrated with serum from this cause. The head of the fœtus is carried into the pelvic brim, and in extreme cases the child is forced so low down that the motions of walking, climbing stairs, or lifting sooner or later bring about its premature expulsion. While this, in the eye of the law, might not be recognized as a method of committing abortion, its results in many cases are successful in the accomplishment of that object.

Women often succeed in ridding themselves of an embryo by violent exertion. Lifting a heavy weight, going up and down stairs, carrying a weight, jumping, washing clothing with violent to-and-fro movements, standing upon a chair or ladder and reaching persistently above it, running a sewing-machine violently, riding a horse or bicycle to excess—all these expedients have been used and have been successful. It is very hard, however, in such a case to prove the criminal intent, as the woman may allege that her occupation obliges her to perform such action. Women occasionally have recourse to violence directed to the abdominal wall to induce abortion. Thus, a woman may strike and bruise her abdomen, claiming that she fell or that she was struck by another person. In extreme cases insane women and very ignorant persons have been known to injure themselves severely by such action.

Second, the effort may be made to induce abortion by the taking of drugs. Any drug which produces violent irritation about the intestine or pelvic organs may result in the production of abortion. Such, for example, are the drastic purgatives, aloes, croton oil, jalap, gamboge, and elaterium. A substance producing violent emesis may cause abortion through the violent efforts of vomiting. Drugs which act directly upon the uterus are ergot, nux vomica, and quinine. The first will produce uterine contractions, and may succeed in expelling the contents of the womb. Its success will depend, however, more upon the condition of the endometrium than upon any other factor. The writer recalls the case of a healthy young woman who secured a prescription including ergot, and who took double doses twice as frequently as the prescription called for without producing abortion. She subsequently went to term and was delivered of a healthy child. When, however, the ovum has become partially separated from the uterus, ergot is usually successful. Strychnine and quinine tend to produce abortion if that process has already begun. In fatal doses strychnine produces tetanic uterine contractions which would naturally tend to empty the womb, but in ordinary tonic doses neither can be said to produce abortion. In addition to these substances there is a considerable class of irritant ethereal oils, among which savin, tansy, rue, and others are used for this purpose. They act upon the genito-urinary system, producing intense irritation of the kidneys, with inflammation of the stomach and intestines. Their action upon the uterus is uncertain, and they frequently fail. Aloes, by its action in favoring congestion about the pelvis, may become an abortifacient in some cases. Many of the remedies sold for this purpose are inert, and depend for their sale upon fraudulent advertisements and claims of properties which are in no way

present. In general, it may be said that, in a healthy woman where the lining membrane of the uterus is healthy, no drug can be relied upon to produce abortion unless it be given in such large doses as to put the patient in great danger through its irritant and poisonous properties.

The third and most usual method of producing abortion consists in active interference with the uterus. This may be attempted by injecting various substances into the vagina. Hot douches have been employed, continued for a considerable period. Injections of acids and of alkaline substances have been used. In a case under the observation of the writer the patient had attempted abortion by vaginal injections of oxalic acid. Cold douches are occasionally employed. Among abortionists, the attempt is sometimes made to introduce within the uterus an irritant and stimulating substance which may produce abortion. Thus, glycerin has been recently employed for therapeutic abortion, and has doubtless been used in criminal cases. The use of injections to produce criminal abortion may be attended by rapidly fatal results, if the injection is practised in such a way as to force air and fluid within the womb. Sudden death may occur after such an injection given with a piston- or a bulb-syringe. Where a fountain-syringe is employed this accident rarely happens. As a rule, the effort to produce abortion by injections is very often a failure. Hot injections are not continued sufficiently long, and are not given with sufficient thoroughness to produce the desired effect. Few abortionists are sufficiently versed in manipulation to make effective injections into the uterus.

A most common method of producing criminal abortion consists in thrusting into the vagina some substance which shall penetrate the uterus, rupturing the membranes, and exciting uterine contractions. Among pregnant women any convenient article may be employed. A stick, a piece of wire, a whalebone, a catheter, a large feather; in fact, any object may be taken for this purpose. Women are occasionally found who have become expert in this manipulation, and who introduce an English catheter into the uterus with great facility.

Among such women this manipulation is usually done after one menstrual period has been missed and signs of early pregnancy begin. If the membranes are ruptured, there is a slight flow of blood and fluid, and the patient goes about her occupation, saying that her sickness is coming back. Such a woman will carefully see to it that the ovum is immediately destroyed, and that all evidences of abortion are removed.

Most cases of criminal abortion are done upon ignorant young women illegitimately pregnant, and are performed by midwives or by professional abortionists. The most skilful abortionists avail themselves of the modern operation of curetting the uterus for endometritis. The patient is brought to such a physician; he finds the womb slightly enlarged and states that evidences of endometritis are present. The patient is taken to a hospital or to a house kept by a nurse, the statement being made that she comes to have the womb curetted for chronic inflammation. After suitable preparation the patient is anæsthetized, the uterus dilated, curetted, and packed with gauze. The operator is careful to break up

thoroughly any pieces of embryo, often describing them as the results of membranous endometritis. Many of these cases pass undetected, while others may be recognized by an intelligent nurse in attendance, or by some one who has seen the patient before the operation. It is unfortunately true that this form of criminal abortion is produced by those thoroughly versed in obstetrics, and whose knowledge of antisepsis is such that they rarely are detected. In the hands, however, of more ignorant quacks, criminal abortion is done in a hasty, bungling manner, with little if any pretence to antiseptic precautions. A uterine sound is most commonly employed, while a catheter and stylet are often used. In some cases the operator makes no mention of abortion, but finds the womb enlarged and introduces a sound to ascertain its depth. Occasionally abortionists employ tents or some form of packing to bring about the desired result. If this be done without antiseptic precautions, it is even more dangerous than the use of a dirty sound.

Where ignorant women attempt to induce abortion by rupturing the membranes they frequently inflict a fatal injury to surrounding organs. A piece of wire has been thrust into the bladder through the vagina, the uterus has been perforated, the rectum has been entered, the catheter has been forced through the vagina into the bladder, where it remained for some time; and the records of forensic medicine contain numerous cases of injury of this sort. As it is impossible for these women to practise antiseptic precautions, they become infected, and in most instances die as the result.

The duty of the reputable physician in a case of criminal abortion is a matter which requires tact and caution. When called to a case of pelvic peritonitis in an unknown woman, no matter what her apparent respectability may be, the physician should keep accurate notes of her condition and his own actions, that he may make a competent witness if called by the Commonwealth. A very interesting question has recently arisen as to whether it is the duty of the physician to inform the authorities regarding the commission of a crime, or whether the patient's condition and the criminal abortion form a professional secret which he is not at liberty to divulge. A common-sense view of the case would be that the physician's first duty is to his patient, to save her life if possible, and that his second duty is to cause the detection and punishment of those who have committed the criminal abortion. If the patient has made the effort herself, it is the duty of the physician to save life if possible, and to keep her secret. If, however, she has been operated upon by others, and especially if a fatal issue occurs, he should at once lay the facts before the authorities, and assist in every way in the detection and punishment of the criminal. It is only by prompt and vigorous action by the reputable profession that the criminal abortionists can be driven out.

Positive evidence of criminal abortion consists in those conditions which prove that pregnancy is existing, or has until very recently been present. The most important evidence that a woman has been in early pregnancy consists in the shape and condition of the uterus. When the body of the womb is found symmetrically enlarged above the

cervix, the cervix softened, and the mucous membrane about the mouth of the womb softened, the presumption that pregnancy has existed recently is very strong. If, in addition to this, a portion of an embryo can be taken from the uterus and proved to be such by gross or microscopic examination, the proof becomes positive. The physician must not neglect the condition of the breasts, and the turgid state of the bloodvessels in the vagina and pelvic floor. But it must be repeated that positive evidence depends upon anatomical conditions. The detection of the method by which the abortion has been produced will depend largely upon the presence or absence of evidences of violence about the vulva and vagina or the uterus. Where irritant drugs have been given the symptoms of hyperæmia of the mucous membranes will be present, but direct mechanical injury will, of course, be lacking. Where, however, the uterus has been entered by an instrument, there will usually be found in the vagina or upon the cervix abrasions and marks of violence which are very significant. This should be carefully noted by the physician, and in suspicious cases he should inspect the parts carefully before himself making a vaginal examination. If this be done, the defence cannot urge that his examinations and manipulations may have caused the lesions which he cites as evidence.

When these patients are seen by a reputable physician they are usually suffering from septic infection. Pelvic peritonitis may or may not be present. The pulse and temperature indicate the infection, while the nervous depression in these cases is often remarkable. The emotional strain to which the woman has been subjected seems to intensify the action of the septic poison upon the nervous system. In abandoned women alcoholism and venereal disease serve to intensify the virulence of the septic process. Many of the most remarkable examples of profound infection are met with in cases of criminal abortion. The majority of these patients die, and the cases are usually hopeless when brought to the attention of lawful physicians. Such cases are frequently sent to hospitals under a diagnosis of inflammation of the bowels, with the hope that the cause of death will not be discovered.

Should a patient survive the abortion, she is likely to suffer permanent injury from its effect. Chronic endometritis of septic origin, pelvic abscess, adhesions of the pelvic peritoneum and of the pelvic viscera will usually oblige her to seek operative relief. It is only in rare cases that a woman survives criminal abortion, to recover her health.

CHAPTER IV.

EVIDENCE OF PREGNANCY AND PREVIOUS CHILDBIRTH.

THE physician is sometimes called upon by the court to give positive evidence as to the existence of pregnancy, or of a previous childbirth. As regards the first, the attention of the reader is directed to what has been said upon the diagnosis of pregnancy, that anatomical changes in the generative organs furnish the only positive evidence of pregnancy. This must be distinctly kept in mind in all cases where an expert opinion is required, either by a patient or by a court. If complications exist which render a positive statement at the time impossible, the physician must not hesitate so to give evidence, asking another examination later, and giving the court clearly to understand that the condition is not pronounced.

The diagnosis of previous childbirth is to be made by a thorough examination of the genital tract. Physicians who rely upon the statements of a patient may be most thoroughly deceived. It is perfectly possible for a strong young woman to give birth to a premature child, and immediately assume her ordinary occupations, and to assert positively that nothing is the matter except her normal monthly sickness. Cases are on record where women, after childbirth and infanticide, have eluded detection and successfully escaped. If the question of the diagnosis of previous childbirth enters at all, it is the duty of the physician to make a thorough examination. He should practise rigid antiseptic precautions, and should precede his examination by thorough inspection of the vulva and vagina. It is almost impossible for a viable child, or even a fœtus after the fifth month, to be born in a primigravida without the occurrence of lesions in the vagina which will call attention to the fact. Such are erosions and abrasions, laceration of the fourchette, rupture of the hymen, slight laceration of the skin-perineum, a soft and patulous condition of the os and cervix, with slight multiple tears, all form a condition most suggestive of parturition. A discharge of blood coming from the uterus points to very recent birth, while a lochial discharge can be referred, by its character, to the period of the puerperal state when such usually is present. In such cases the physician will frequently find within the cervix or uterus portions of the placenta or membranes, which furnish proof positive of the previous birth. The inspection of the breasts will usually complete the clinical picture.

It is sometimes necessary for the physician to make a positive decision, as to whether a patient has ever given birth to a viable fœtus. This may be interesting from a legal standpoint, and also from the standpoint of practical medicine in determining the course of action in a given case. Thus, if a woman has a slightly contracted pelvis and asserts that she is pregnant for the first time, the physician naturally

is without previous experience on her part to determine the probable course of her coming labor. If he takes her statement simply, he may be led to the induction of labor earlier than if he ascertains that she has already borne a child, and that the birth proceeded with but little difficulty. Hospital patients very frequently deceive in this matter, and the physician must examine the patient to determine the truth. In women who have born a viable child the walls of the vagina are seldom in apposition as in the nulliparous woman. The presence of the hymen and fourchette, or their absence, gives added testimony. While the cervix may be without extensive tear, still it is never so small after childbirth as before it, and the edge of the os usually presents slight fissure and thickening. If the woman did not nurse the child, the breasts may show little alteration; but there is usually some change about them to attract the physician's attention. If a woman has gone to term with a child, the abdominal wall is rarely as firm and elastic afterward, while a deposit of fat is very commonly seen in women who have borne children. A careful and systematic examination will rarely fail to give sufficient evidence to enable the physician to form a positive opinion.

CHAPTER V.

THE LEGAL ASPECTS OF OBSTETRIC PRACTICE.

No branch of medicine entails upon its practitioners so grave responsibilities as obstetrics, and in no branch of medicine in the United States are the legal obligations of practice so commonly violated. While there are variations in the State and city laws regarding attendance upon labor cases, the consensus of law holds that none but a legally qualified person shall deliver women and make returns to health officers for birth. A legally qualified person in most of the United States is a person holding a certificate to practise from a State board, or a person holding a diploma registered in a town or city from a medical college, or a midwife registered as such by the Health Department of a given Commonwealth. The undergraduate medical student does not come under any of these heads, but outpatient practice in obstetrics, with many medical colleges and maternity hospitals, encourages the undergraduate to deliver cases of labor, assuming the practical responsibility for these cases. An effort is made to comply with the intent of the law by saying that graduate consultants are always ready to assist in these cases; but the summoning of the consultant is left to the judgment of the student, and the most serious obstetrical emergencies may arise and terminate before the consultant can be procured. This abuse has risen largely from the neglect of obstetrics by the false conception that labor in all women is a natural process, and one which tends of itself to a

successful termination. In an ideal community, where all of its members were in strictly physiological condition, this statement would be true; but in the presence of constitutional diseases and defects and amid surroundings of poverty and filth the converse is often more near to the truth. The question of the function of midwives has occasioned wide discussion among obstetricians. The European midwife is graduated from a school under the direct supervision of a medical faculty appointed by a government university. The duties and privileges of such a midwife are exactly defined by law; she is fully instructed in these duties, and obliged to keep within her bounds under pain of losing her certificate and right to practise. Large numbers of normal labors are attended by such midwives on the continent of Europe. This system, however, even with the restrictions put upon it, results in much harm. In many cases assistance is not obtained, when complications arise, until too late to save the life of the child and possibly that of the mother. Much valuable scientific material for study and teaching is not utilized, and the most that can be said of the practice is that it places an undesirable condition of affairs under as strict limitations as possible. In England an agitation upon the midwives question is a chronic feature of medical discussion, and while restrictions are not enforced looking to the lessening of the evil, it cannot be regarded as a satisfactory condition. The comparatively recent civilization of the United States leaves the practice of obstetrics in a very mixed condition. The large numbers of foreigners who come to this country bring with them midwives, who seek to be registered and to practise. Some of these women have had a reasonable training, while others are ignorant, exceedingly dirty, and most undesirable. As the laws of our cities are now formed, many obtain recognition and register who are utterly unworthy of such privilege.

The multiplication of hospitals and obstetricians in the United States has largely increased the skilled medical service obtainable for confinement-cases among the poor. Our best medical schools have now maternities attached to their hospitals, where such cases are treated with the advantages of the best scientific methods. Our polyclinics give instruction to graduates who are competent to attend cases in the homes of patients. A most interesting work in the teaching of obstetrics in private houses is done by advanced teachers in New York, who find no difficulty in sending to each case of labor a graduate, a legally qualified practitioner, to superintend the case. With the improvement in our civilization obstetric practice should be subjected to strict legal requirement, and the obstetrician should no more think of sending a medical student to a case of labor than would a surgeon, who would not allow an undergraduate to go to the house of a patient and set a fractured limb or perform even a minor operation. It is to be regretted that gynecologists occasionally utilize obstetric patients to feed their operative clinics, in utter disregard of the rights of patients and obstetricians.

The establishment of visiting nurse societies in our large cities has made it possible to conduct obstetric cases in the houses of the poor under advantages of good nursing. It is perfectly practicable to allow medical students to attend cases of labor in the houses of patients,

accompanied by a legally qualified instructor, who shall permit them to take such part in the case as the circumstances allow. With the attendance of a visiting nurse and the presence and instruction of a graduate instructor, the student will obtain accurate information, and become qualified to assume the responsibilities of obstetric practice. The familiar statement that the student will learn more in obstetrics by going alone to cases and meeting emergencies unprepared is a scientific absurdity, and is at utter variance with the best methods of scientific instruction in other branches of medicine.

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