the result is that the opponents of vaccination still lack a scientific statistician as an exponent of their views (editorial in *Practitioner*, 1891, vol. xlvi., p. 465).

The smallpox statistics of Prussia, which Dr. Wallace presented to the commission, were brought down to the year 1874, and there discontinued. The compulsory law of Prussia was enacted in 1874, and Dr. Wallace admitted that "he had heard of it," but had not seen any evidence that it made any important difference.

On the contrary, there are nowhere to be found any statistics so absolutely conclusive of the value of vaccination as the comparative statistics of Prussia for the two periods before and after the enactment of the compulsory vaccination law of 1874.

The London *Lancet*, in commenting upon the testimony of this witness, says that Dr. Wallace's theory was based upon "blunders that would hardly be expected of a school boy," and in a concluding paragraph upon the same subject affirms, "if this is all that science can do for the antivaccinationists, the scientific value of vaccination stands more than ever confirmed." But, notwithstanding the exposure of his errors, the philosopher obstinately adheres to his position that "vaccination is a delusion" ("The Wonderful Century," New York, 1899). In this paper he quotes largely from the experience of English towns in which vaccination is only partially enforced, and utterly ignores the greatest and best example of modern times—the German nation. He also quoted the experience of Leicester, England, but takes special pains to omit all reference to the difference between the smallpox mortality of the vaccinated and the unvaccinated in that city, as shown so clearly by its medical officer, Dr. Priestly, in his report of the epidemic of 1892–93. Out of a total of twenty-one deaths from smallpox in that city nineteen were those of unvaccinated persons, one had been vaccinated and the facts in regard to the remaining one were unknown.

The principal modern opponents of vaccination who have published their views upon the subject are Prof. E. M. Crookshank, Dr. Charles Creighton, Professor Wallace, Mr. William Tebb, Prof. A. Vogt, of Berne, and Lorinser, of Vienna.

The final outcome of this legislative farce was the enactment of the "conscientious objector" clause already quoted. The practical operation of such a law is sufficiently illustrated in the following report of the first case which came to trial January 27th, 1899:

THE FIRST APPEAL UNDER THE VACCINATION ACT, 1899. REGINA V. WELBY, EX-PARTE BIRD, JANUARY 27TH, 1899.—The absurdity of the provisions of § 2 (1) of the Vaccination Act, 1898, which require that the parents or person responsible for having a child vaccinated must "satisfy" the magistrate before whom he is brought, that he "conscientiously believes that vaccination would be prejudicial to the health of the child," in order to escape liability to a penalty under § 29 or § 30 of the Vaccination Act, 1867, was fully demonstrated in the above case, which formed the ground of the first appeal under the section.

One Walter Bird had endeavored to "satisfy" the stipendiary magistrate of Sheffield as to his child, as required by § 2 (1) of the Act, but failed to do so. Being convinced that the stipendiary ought to have been "satisfied," he applied for and obtained a rule from the court of Queen's Bench (the Lord Chief Justice and Mr. Justice Wills), calling on the stipendiary to show cause why a *mandamus* should not issue directing him to hear and determine the case, as he had declined to grant exemption to the child on the ground that he did not believe that Bird conscientiously believed that vaccination would be injurious to the child.

In granting the rule the Lord Chief Justice said, *inter alia*:

"The section clearly said that the magistrate was to be satisfied, not in his opinion that vaccination would be prejudicial to the health of the child, but satisfied that the applicant conscientiously believed that vaccination would be prejudicial to the child."

When the case came on for hearing before the Divisional Court (Lawrence and Channell, J. J.), after the affidavits of the parents had been read and explained by counsel, who stated that the parents had been prosecuted and had suffered great inconvenience, Channell, J., said: "The magistrate said in his affidavit, 'A certificate was not given because I was not satisfied that he believed that vaccination would be prejudicial to the health of the child.' They could not grant a *mandamus* to compel him to be satisfied. . . . He has to satisfy the magistrate of his belief, and he has not done so. Even if the magistrate is wrong, we cannot make him be satisfied."

The rule was discharged (Himes' "Handy Guide to the Public Health Acts," London, 1901).

Dr. Creighton's views upon vaccination are sufficiently set forth in his article in the twenty-fourth volume of the "Encyclopædia Britannica," and in his book entitled "Cowpox and Vaccinal Syphilis." In the former he takes the ground that there is neither identity nor even affinity between vaccinia and variola. He also asserts his belief that the diminished activity of variola is due to epidemiological laws, and not to vaccination. In his exceedingly superficial statement of the practical working of vaccination laws, like Dr. Wallace, he omits reference to the convincing experience of Prussia since the enactment of more efficient laws in 1874, although a dozen years or more had elapsed from that date to the publication of his article in the "British Encyclopædia."

The various publications issued by the opponents of vaccination are characterized mainly by the absence of facts and the presentation of an abundance of theory. For example, a recent work by Mr. William Tebb, intended to prove the "synchronicity between the spread of leprosy and vaccination," introduces many arguments in support of an alleged connection between the one and the other. But leprosy produced its most disastrous effects in the twelfth, thirteenth, and fourteenth centuries, when vaccination was unknown. There were then nineteen thousand lazarettos in Europe. Now that the human race is much more widely distributed over the globe, leprosy is far more rare, and exists to its greatest extent in countries where vaccination is but little practised. In the United States, where probably more than three-fourths of the population is vaccinated, leprosy is confined chiefly to a very small number, among whom the disease was introduced directly from other and infected countries.

Leprosy has for many years been prevalent in Bombay, but since the introduction of vaccination there, by the British Government, the ratio of lepers has gradually diminished.

Much importance has been attached by the opponents of vaccination to certain statistics which were published in 1872–73 by Dr. Keller, the chief physician of the Austrian State Railway, who was himself an opponent of vaccination. These statistics were quoted largely by Lorinser of Vienna, Vogt of Berne, and by Reichsperger, all of whom were antivaccinationists. Körösi recently investigated the sources of these statistics, and ascertained that Keller was dead, and that the original documents could not be found. He then corresponded with all of the physicians who had contributed material to these statistics, who were still living and could be found, and learned that not only had Keller suppressed important data, but had actually altered the returns to suit his own views. One of the physicians who contributed to the returns confessed that "the data were prepared in conformity to the taste of their chief, whom he knew to be opposed to vaccination."

The committee of the Ninth International Medical Congress who examined the proofs of these statements reported that they were "forced to declare that the statistics of Dr. Keller were found to be false; that they are an unpardonable effort to mislead public and scientific opinion, and that henceforth no weight should be attached to them, having been proved by us to be entirely incorrect."

*Samuel W. Abbott.*





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**VAGINA, ANATOMY OF.** See *Sexual Organs, Female.*

**VAGINA, CONGENITAL MALFORMATIONS OF THE.**—DEVELOPMENT OF THE VAGINA.—A knowledge of the mode in which the vagina is developed is essential to a proper understanding of its congenital malformations.

The lower portions of the two Müllerian ducts coalesce to form the vagina, and by the ninth week of embryonal life the intervening septum disappears, and this union is complete, although the appearance of the cervix and the differentiation of the genital passage into uterus and vagina cannot be said to take place before the fifteenth or sixteenth week. In the nineteenth week of fœtal existence a slight projection of mucous membrane makes its appearance on the posterior wall of the entrance to the genitalia, just above the point of union of the vagina with the urogenital sinus, and a little later a smaller projection at a slightly higher level may be seen on the anterior wall. These elevations subsequently unite laterally, and thus form the hymen, which, by the twentieth week, is fully developed.

VARIETIES OF CONGENITAL MALFORMATIONS.—The vagina may be entirely absent; it may be more or less completely closed by a transverse, or divided by a longitudinal, septum; though not seriously misshapen it may still be too short or too narrow; or it may communicate with cavities from which it should properly be separated. There are yet other errors in development, which are, however, of less import.

A. *Absence of the Vagina.*—When there is total failure in development of the lower portions of the ducts of Müller the vagina is entirely absent, and only a thin septum intervenes between the bladder and the rectum, in which some little connective tissue, but no muscular elements, are discoverable. A fibrous strand or cord may, however, indicate the situation which should be occupied by the vaginal tube. When the Müllerian ducts are developed, except at their very lowest extremities, or are not prolonged downward far enough to open into the aditus urogenitalis, then only the most inferior portion of the vagina is wanting.

Absence of the vagina is usually associated with some other marked maldevelopment, such as absence or a rudimentary condition of the uterus. The condition of the uterus will determine the existence or non-existence of retained fluids.

In absence of the vagina the urethra is found to be abnormally relaxed.

If there is hæmatometra, an operation designed to create a passage where the vagina should be located is imperative; and even when only a very rudimentary uterus can be discovered, and there is no retention, the general health of the individual is often markedly improved after operative interference is instituted, and the uterus has been known to take on active growth.

When there is sufficient space between the bladder and rectum, a vagina can be made by stretching and tearing the intervening tissues with the finger, aided by the use of blunt-pointed scissors, if great resistance is encountered.

A sound in the urethra, and the finger of the operator or of an assistant in the rectum, are useful guides. The operation should be completed at one sitting, and the passage should be made larger than it is thought desirable to have it subsequently remain. Undue contraction is prevented by the use of a vaginal plug of glass, and the cicatricial tissue which forms over it is said to resemble very closely normal mucous membrane.

When the uterus is well developed, and there is retention, but no vaginal passage can be formed, Battey's operation may be indicated.

B. *Atresia of the Simple Vagina.*—In this condition the occlusion of the vagina is absolute. The obstruction may be seated at the hymen—atresia hymenalis, or at some point within the vagina proper—atresia vaginalis.

*Atresia Hymenalis.*—Atresia hymenalis is the most common variety of vaginal atresia. The duplicature of mucous membrane constituting the hymen here forms an obstruction, which, although thinner and more elastic than the atresias situated above in the vagina, yet may

be considerably thickened and of almost cartilaginous toughness. As menstrual blood accumulates, the hymen bulges downward, and the vagina dilates above, until it forms a sac filling the pelvic cavity. The uterus at first is undisturbed, and rests upon the summit of the distended sac. Ultimately the cervix, and even the uterus, if no outlet is found below, become dilated. The tubes likewise suffer, but the blood discovered in them is by some not regarded as an overflow from the uterine cavity, since the uterine ends of the tubes are often closed, and the blood is located in small diverticula or sacs near the fimbriated extremities, and is said to originate in hemorrhages from the mucous membrane of the oviducts themselves. The blood may, however, subsequently escape into the peritoneal cavity from the fimbriated ends of the Fallopian tubes.

*Atresia Vaginalis.*—In atresia vaginalis the obstruction (or obstructions, for there may be several, located one above the other, and separated by layers of different kinds of retained fluid) is generally found in the lower third of the vagina. The thickness of the atresia varies in different cases, and whatever may have been its original dimensions, pressure from the fluid accumulation above produces sometimes a remarkable degree of thinning. Thus the obliteration may be 1.2 inch thick, or of membrane-like delicacy. In atresia vaginalis, however, we do not find the elasticity and distensibility met with in atresia hymenalis. The occluding membrane, made up largely of connective tissue, is of a firmer texture and greater thickness, and yields less readily beneath the superincumbent weight. As a result of this, the lower part of the vagina and the vulvar orifice are seldom dilated, and the former is not uncommonly narrow and cone-shaped, although attempts at coition may materially modify its shape, while the occluding diaphragm viewed from below may appear quite flat.

It is very important, in view of proposed operative interference, to ascertain the seat and thickness of the occluding membrane, and this is best done by the various combined methods of examination, a catheter or sound placed in the bladder being employed to assist the finger in the rectum or vagina.

Above the obstruction, as in atresia hymenalis, mucus or blood accumulates. The seat of the atresia, and the activity and frequency of the menstrual function, determine largely the quantity of the accumulated blood; but, as has been pointed out, nature, discovering an obstacle to escape, retards in some way the amount of blood effused, so that it is never as great as one would expect to find it, considering the number of periods that have occurred, and is always less in congenital atresia than in the acquired condition. It is probable, also, either that the uterus is in an immature and inactive condition, or else that the fluid elements of the accumulated blood have been largely absorbed. The peculiar characteristics of the retained liquid would seem to support this last assumption, for it is found to be dark reddish-brown in color, and of a thick, tenacious consistence, the mucus mingled with it preventing coagulation.

Microscopically it is found to contain shrivelled blood corpuscles, and extravasated blood pigment, with flat epithelial cells, mucous corpuscles, and granular débris.

As in atresia hymenalis, the genital tube above the point of obstruction dilates as the retained fluid accumulates. At first the vagina, then the cervical canal, and finally the uterine cavity become filled and expand often to a remarkable degree; the distended vagina will, however, always constitute the major part of the tumor. If the liquid is mucus, the conditions known respectively as hydrocolpos and hydrometra develop; if blood, then the terms hæmatocolpos and hæmatometra are employed. Fortunately, the walls of the dilated portion of the vagina, although overstretched, do not become thinned. On the contrary, they hypertrophy, especially their musculature, and the condition known as "excentric hypertrophy" is thus developed.

The vaginal walls internally may be thrown into folds, although the sac be greatly distended. Occasionally, in new-born children, the folds of mucous membrane on opposite walls of the vagina become united, forming a thin, transparent diaphragm, which soon ruptures spontaneously, and is seen no more.

The origin of the obstruction in atresia hymenalis has been variously explained. It is said that the fusion of the lower ends of two solid Müllerian ducts will produce this abnormality, or that there may be an overgrowth of the fold of mucous membrane which constitutes the hymen and a union of its free edges toward the centre of the ring. Fœtal inflammation may likewise produce an agglutination of these same free edges after the hymen has been completely formed. Numerous hypotheses have likewise been advanced to explain the origin of atresia vaginalis. Either the lumen of the vagina at some point has never been established, as when the Müllerian ducts as solid cords have united, but have failed to become hollowed or tunnelled at the point in question; or else, after a normal formation of the vagina by proper coalescence and perforation of these ducts, its walls, for a variable distance, become united one with the other, as the result of an inflammation during intra-uterine life. And further, the idea has been suggested that, in cases in which there is but one septum, the canal above the septum may belong to one Müllerian duct and that below to the other. In explanation of the fact that atresias are most often seated in the lower third of the vagina, it should be borne in mind that the walls of the vaginal tube are very closely approximated just above the seat of the hymen, and agglutination is thereby rendered easy.

Atresias of the vagina are important only as interfering with menstruation and coition. Hence, although exceptionally before puberty these occlusions may give rise to inconvenience or suffering (as in certain cases of profuse secretion of mucus and the formation of a hydrocolpos, a condition rarely of significance in adults), yet in the majority of cases it is not until the establishment of the menstrual function, and, more rarely, when graver rudimentary conditions exist and the catamenia do not appear, not until after marriage, that symptoms manifest themselves and a physician is consulted. Certain well-known general conditions may likewise postpone the ushering in of the first menstrual period, and then if an accumulation occur it will be of mucus and not of blood.

In atresia of the hymen or of the vagina proper, when puberty arrives the usual disturbances which precede and accompany the catamenia are noticed, but there is no discharge. At the time of the next period these disturbances are somewhat accentuated, and, as the fluid accumulates, gradually change to suffering, which is experienced now during the intermenstrual period as well. The tumor produces pain and a feeling of weight in the pelvis, and by pressure or traction upon the bladder and rectum interferes with micturition and defecation. There is sometimes, too, no little constitutional disturbance. The amount of fluid and the consequent size of the tumor determine in large part the intensity of suffering, which is also influenced by the general condition of the patient.

Usually, after menstrual molimina have been noticed for three successive months, a tumor begins to be apparent, although it may not be noticed until a much later period, and this swelling gradually enlarges until it bulges at the vaginal inlet and causes a perceptible increase in the size of the abdomen. Certain conditions previously described may, however, retard its development, and the sac may never attain very great proportions.

If menstruation has never appeared and the accumulation of mucus has not been excessive, it may be that futile or unsatisfactory attempts at intercourse first reveal the existence of an atresia. Yet if the atresia be elastic or high-seated, repeated efforts at cohabitation ultimately form a fairly roomy canal, or, if the diaphragm be low or unyielding, intercourse may be carried on through the urethra or anus. It is extraordinary how greatly the urethra may become dilated under these circumstances, and it is still more singular that incontinence of urine so seldom results. Occasionally sterility first induces a patient to seek medical advice.





Spontaneous rupture of the occluding membrane and evacuation of the retained fluid are rare in both forms of vaginal atresia; they occur in only one per cent. of cases of atresia vaginalis. And, indeed, although a source of temporary relief, this natural effort at cure is of somewhat questionable value. Pyocolpos and pyometra almost invariably result, and the danger to the patient is, if anything, aggravated. Yet if spontaneous perforation does not occur, and no surgical procedure looking to the emptying of the sac is instituted, the outlook is extremely unfavorable. Rupture of some portion of the distended genital tube, or of a blood sac in the oviduct, is almost sure to occur, or else without rupture a grave peritonitis may develop.

The symptoms observed at puberty, and repeated periodically afterward, which have already been detailed, are quite characteristic, and, with the accompanying physical signs of a gradually increasing retention tumor, leave but little doubt as to the diagnosis. It is true that amenorrhœa and abdominal enlargement may, and sometimes do, give rise to the impression that pregnancy exists, but this is rapidly dispelled by a local examination and a careful inquiry into the history of the case. In view of the serious nature of the malformation in question the physician is justified in insisting at least upon an examination of the rectum and abdomen, if not of the genitals, in all doubtful cases. And this examination should be undertaken early and be performed carefully; for although the recognition of a vaginal atresia is a matter of no great difficulty, yet it is not always easy to determine the exact seat, and more especially the thickness, of the obstructing membrane, which are matters of great importance when surgical interference is attempted.

The various combined manual and digital methods of exploration are the means generally employed, and a sound or catheter of some resistant material, placed in the bladder, often assists in arriving at a definite opinion. In children the persistence of dysuria may, after simple remedies fail, suggest the necessity for an examination; and in adults dyspareunia and sterility, in a case in which menstruation has never occurred, likewise require investigation. To differentiate between atresia hymenalis and atresia vaginalis is not always so easy as one would suppose. In atresia hymenalis, if there be retention, the sac distends the perineum and protrudes from the vulvar orifice. The obstruction in atresia vaginalis is thicker and less elastic, and there is not so much likelihood of distention of the lower vagina and separation of the vulvar fissure; but if it be seated, as is usual, in the lower third of the vagina, the sac may bulge through the genital outlet, the hymen being seen adherent to it like a fringe. However, in atresia vaginalis the lower part of the vagina is often narrow and cone-shaped, and the diaphragm itself may appear flat. Atresias of the vagina which are located at a higher level are more difficult to delimit accurately, but are less likely to give rise to confusion with imperforate hymen.

It is not always easy in a given case to decide whether an atresia is congential or acquired. Even in children injury and subsequent inflammation of the vagina may produce occlusion, although stenosis, rare as a congenital condition, is more likely to result.

The existence of a rudimentary state of other portions of the genital apparatus, and the absence of tissue irregularities, cicatricial bands, and the remains of destructive inflammation, point to the congenital nature of the affection. Atresia of the hymen is very rare as an acquired condition.

The prognosis, in cases of vaginal atresia with retention, is almost without exception unfavorable, and this is especially the case when the fluid consists of menstrual blood. Where nothing is done, a fatal termination is invariably to be expected, through rupture of some part of the sac, or as a result of septic infection or peritonitis, independently of rupture. If perforation of the occluding membrane and evacuation of the cavity do occur, pyocolpos and pyometra follow with rare exceptions, and the danger to the patient, though less imminent, is hardly less certain. Even in spite of the most active treatment, the existence of a large sac secreting pus, which often is in free communication with the peritoneal cavity, is a constant source of apprehension, and a termination by no means favorable is to be anticipated.

In every case of atresia with retention it may be safely said that surgical intervention is urgently required. But even this is not free from danger or difficulty. For immediate rupture of a blood sac in the Fallopian tube may introduce a complication of the greatest gravity, or septic peritonitis may subsequently develop. In atresia hymenalis an operation is likely to be followed by a better result than in atresia vaginalis.

While the greater number of the congenital malformations of the female genitalia appeal only to the student of development and of pathological anatomy, vaginal atresias possess great clinical interest and are of the utmost practical importance. It is true that in a certain proportion of cases of vaginal atresia relief is sought before puberty is reached, and in other instances not until sexual intercourse proves to be difficult or impossible, and conception fails to occur; yet in the majority of cases of atresia, where suffering follows the establishment of the menstrual function and is dependent upon retention of the menstrual fluid, surgical intervention is urgently demanded. Almost without exception the condition of the patient is not recognized until this time, or else the obstruction could be divided before stasis had begun or before it had become considerable. The most satisfactory results are to be looked for when an operation is undertaken while there is yet no hæmatometra.

Although the methods of operating vary according to the nature of the obstruction and the taste of the operator, yet the indications are always the same. In every case an opening must be made through the occluding tissue (at a time midway between the two menstrual periods), sufficiently large to permit the free egress of the retained fluid, and this opening must be maintained in order that the sac may be thoroughly emptied and kept empty. In atresia without retention the same general plan of procedure is necessary, so that the vaginal tube may be kept sufficiently patulous to offer no obstacle to intercourse, conception, and delivery. Hymeneal atresias may be incised or punctured, and the opening thus made can be immediately or subsequently enlarged with the finger.

Atresias of the vagina which are simply due to an adhesion of its walls are sometimes easily broken down with the finger alone or with some blunt instrument. But if the atresia is due to a pronounced rudimentary condition of the genital canal, bloodless dilatation is hardly possible. In such cases the obstructing tissue must be carefully and slowly divided with a knife, or, preferably, with blunt-pointed scissors and the finger, a silver catheter guarding the urethra and bladder, and an assistant's finger the rectum, until the retention tumor is reached. Breisky, of Prague, who minutely describes the method of operating in high vaginal atresias, accompanied perhaps with atresia of the cervix, advises that as soon as the sac is encountered it should be punctured opposite the site of the cervix, or, if this cannot be found, at the lowest part of the vault of the tumor, with a long-handled lancet-shaped knife, the blade of which is surrounded and protected by a cannula. As soon as the blade has been projected from the cannula into the tumor, and the opening has been enlarged laterally, the knife is withdrawn and the cannula is pushed for some distance into the sac. The blades of a dilator, especially designed for this purpose, are next introduced alongside of the cannula, and the opening into the tumor can be enlarged in any direction, to any extent, or with any degree of rapidity that is deemed desirable. After this dilatation a German silver tube is introduced to serve for drainage, and likewise for the introduction of antiseptic fluids, and the dilator is removed. Whatever form of

drainage-tube is employed, it should always be of some resistant material, and should be provided with large fenestrations. As the walls of the retention tumor subsequently contract, a tube smaller than the one first used should be substituted.

Although this mode of operating is based upon sound principles, and is intended to prevent any injury being done to the surrounding hollow organs and peritoneum, to enable the surgeon to control the rapidity of the escape of the retained fluid, and to maintain after the operation a free communication with the sac, yet it is quite probable that the same results could be achieved without the aid of the special instruments described, and with a greater degree of simplicity in manipulation.

The prognosis in cases of neglected vaginal atresia is unfavorable, nor is a more hopeful issue always to be anticipated after operation. Like many other gynecological procedures the danger here is out of proportion to the magnitude of the operation itself; for even puncture of a thin hymeneal septum may be followed by a fatal result.

The untoward accidents which may accompany or follow measures instituted for the relief of atresia vaginalis are: (1) injury of neighboring organs or of the peritoneum; (2) rupture of tubal blood sacs; and (3) septic infection.

The first of these dangers is not to be anticipated in operating upon the imperforate hymen or upon vaginal atresias of moderate extent, but where there is a considerable defect of the vaginal tube, and the atresia is broad and deeply seated, it requires the greatest care, especially when sharp-pointed instruments are used, to avoid wounding the urethra, bladder, rectum, or peritoneum.

Rupture of the tubes may follow operative interference in even the simplest forms of vaginal occlusion. The Fallopian tubes, distended with blood, or containing diverticula, or sacs filled with blood, are very prone, when the menstrual function has been established for some time, and there has been considerable retention, to form adhesions with surrounding tissues or organs. When the retained fluid is evacuated, and the distended genital canal collapses and contracts, great traction is exerted from below upon the fixed, thinned, and friable tubal wall, and rupture is very apt to occur. Increased pressure of the abdominal walls, blood forced by uterine contractions into the tube, and even contractions propagated from the uterine to the tubal wall, are said to increase the probability of this untoward accident. Rupture of the tube is a most unfortunate complication, to prevent which efforts have been made to alter slowly the size and position of the overfull uterus and vagina by withdrawing the fluid gradually through a small trocar puncture, or by several successive tappings. It is certainly wise to proceed slowly, and to withdraw the greater part, if not all, of the retained fluid through a small opening, which is to be enlarged after evacuation is completed. In this way changes in pressure occur slowly, and the genital canal has adequate time to adapt itself to its new position and surroundings. But the entire operation should be concluded at one sitting, or otherwise, while avoiding rupture of the tube, we court danger through septic infection, and subsequent disintegration of the tubal walls may occur as a result of this process. Breisky suggests that in some cases it might be well to perform abdominal section and remove the hæmatosalpinx, or incise and drain it, if such is known to exist, before the operation upon the atresia is attempted.

Septic infection, the third of the complications already mentioned, may be caused by absorption from the divided surfaces of the atresia, and the actual cautery and galvanic current have been used instead of the usual cutting and puncturing instruments in order to obviate this danger. But such an origin is somewhat questionable in view of the greater liability of the contents of an incompletely emptied sac to undergo decomposition, and the much greater importance which this factor assumes. It is septic decomposition and absorption which increase so signally the risk of repeated punctures and gradual evacuation. Emmet long ago showed the fallacy of this procedure, and the principles which he then urged upon the profession have now been accorded universal acceptance and approval. We should evacuate the cavity slowly if tubal rupture is anticipated, but, nevertheless, always at one sitting. Subsequent risk of decomposition within the sac is diminished by providing for adequate drainage. The sac immediately after operation may be thoroughly irrigated with an appropriate solution thrown into it under low pressure, and not so hot at first as to stimulate uterine contractions; but if the entrance of air is prevented, or only sterilized air is admitted, the danger to the patient is materially lessened. When the operation is performed with the spray and other antiseptic precautions, and the outer end of the drainage-tube is wrapped in some absorbent material impregnated with an efficient germicide, the outlook is rendered exceptionally favorable. Under certain circumstances it might be judicious to postpone washing out the canal until after evidences of decomposition have become apparent, in the meanwhile care being exercised to secure adequate drainage. Irrigation is always indicated when pyocolpos and pyometra are recognized.

When the immediate danger to the patient is over, the physician is confronted with the problem of how best to keep patulous the opening that has been made. The tendency of artificial passages through extensive atresias to close is remarkable; various plans have been suggested to obviate this difficulty. The use of the glass tube, which can be introduced into the vagina by the patient, and can be worn for as long a time as is desirable, is especially commended by Emmet. Breisky, on the contrary, prefers dilatation with the fingers or speculum, to be begun eight days after the operation, and to be repeated at suitable intervals. If the divided edges can be covered with a flap of skin or mucous membrane, as has been done in exceptional instances, an excellent result is assured. Cohabitation, if the patient be married, materially assists subsequent efforts to keep the canal open. Puncture of hæmatocolpos through the rectum or bladder should be mentioned only to be condemned.

C. *Congenital Stenosis of the Simple Vagina.*—While atresia of the vagina means complete, stenosis implies only partial, occlusion of that canal, so that menstrual blood can find an exit, and conception can take place, things impossible in the former and more rare condition.

As in atresia, the hymen or the vaginal canal above it may be affected, though congenital stenosis of the hymen is uncommon. There may be a septum perforated with openings so small as only to become apparent when the menstrual blood trickles through them, or bands of tissue extending from one portion of the vagina to another, or again, spiral or ring-shaped folds projecting from the vaginal surface. Pronounced stenoses are not commonly encountered where the remaining portions of the genital apparatus are normally developed.

The same causes which produce atresia of the vagina, though operating less actively, occasion stenosis of this canal, namely, fœtal inflammatory processes occurring late in embryonal development, and overgrowth of the hymeneal folds.

In this condition there may perhaps be temporary amenorrhœa when the stenosis is very pronounced, followed by dysmenorrhœa from forcible contractions of the vagina and uterus; but since there is always some opening for the escape of menstrual blood there is no development of a retention tumor nor of the painful and alarming disturbances incident thereto. Cohabitation may be interfered with, but there is no insuperable obstacle to conception, and while labor is occasionally made tedious and difficult, the characteristic tissue changes of pregnancy often render the structures soft and dilatable. Still, in certain cases, without surgical intervention delivery cannot be accomplished, and even rupture of the vagina during labor has been known to occur.

The diagnosis is easy, as a rule, although it may sometimes be difficult to find an opening, and the condition is





hence mistaken for an atresia. It is, however, not impossible to confound acquired with congenital stenosis, and a spasm of the muscles of the pelvic floor may lead one into error.

For obvious reasons the prognosis in stenosis presents none of the grave aspects that characterize atresia of the vagina.

When to lessen the difficulties attending coition, and to increase the probabilities of conception, it is desirable to enlarge the strictured vaginal canal, this may be accomplished by the use of tents, sounds, dilators, and the like, but the results are never so satisfactory as when the edges of the occluding bands or folds are incised, and dilatation by speculum or antiseptic tamponing is afterward systematically employed. Cohabitation alone often ultimately achieves the desired end, and during labor the advancing head accomplishes an extraordinary degree of dilatation. Yet it is never safe at this crisis to rely entirely upon nature's efforts to overcome the obstruction, for the most untoward accidents have been known to occur. It is best during delivery to divide at once any obstructing band which seems likely to delay materially the progress of the child, though incision should always be made as superficially as possible.

D. *Divided or Duplex Vagina.*—In this condition the vagina is divided into two lateral halves, rarely of equal dimensions, by a more or less perfect septum, consisting of two folds of mucous membrane, separated by a little muscular and connective tissue. This partition may be complete, or may be perforated by a number of openings, or its presence may alone be indicated by a band or by bands of tissue connecting the upper, middle, or lower portions of the anterior and posterior vaginal walls. With double vagina the uterus is usually also double, but may be single, and there may be a portion in each half of the vagina, or the uterus may have two openings in one side and none in the other. When the uterus is single and the vagina double, only that half of the latter is suitable for coition which ends in a cul-de-sac above; and in one-horned uterus, with atrophied second horn, the side of the vagina which corresponds to the atrophied half of the uterus is generally found in a very rudimentary condition.

There may be atresia of both halves of a duplex vagina, although one side—in a vast majority of cases the right—is alone occluded as a rule. As a result of this, bilateral or unilateral hæmatocolpos may develop. Spontaneous perforation of the obstructing membrane and evacuation of the contained fluid, and rupture of tubal blood sacs, occur more often here than in the case of atresia of the simple vagina.

Duplexity of the vagina results from a persistence of the septum between the Müllerian ducts, which should have completely disappeared by the end of the twelfth week of embryonal life. Coalescence of the two ducts of Müller begins not far from their points of outlet, between the lower and middle thirds of the future genital tract, and extends upward and downward, but more upward in the former than in the latter direction. A single vagina with a double uterus is hence a more common condition than a double vagina with a single womb.

The septum of a duplex vagina may interfere with coitus, and during labor the descending fœtal extremity may not follow either canal, displacing the partition laterally, but may push the septum or band before it, delivery being thus impeded.

When there is atresia of both halves of a duplex vagina the symptoms will be almost identical with those accompanying occlusion of the simple canal. When, however, only one half is obstructed, moliminal disturbances will occur with retention in the obstructed half (hæmatocolpos and hæmatometra lateralis), but a menstrual discharge will regularly escape from the patent portion of the tube, and in the intermenstrual periods a catarrhal outflow will occur.

The diagnosis is facilitated by remembering that in this condition there are present all the symptoms accompanying atresia of the simple vagina with the exception of amenorrhœa; the menstrual flow regularly recurs and the retention tumor that is developed has a distinctly lateral situation. This latter fact may lead the examiner to confuse hæmatometra and hæmatocolpos lateralis with peri-uterine hæmatocele, with cystic enlargements of the ovary and Fallopian tube, or with soft uterine myomata. But if the atresia is seated near the vaginal outlet, no such error is likely to arise, and familiarity with the history of the case will usually solve any apparent difficulties.

The same dangers attend atresias of the double vagina that are present in obstruction of the simple canal. Rupture of the Fallopian tubes may occur, or, after spontaneous perforation of the occluding diaphragm, pyocolpos and pyometra may develop with subsequent involvement of the tubes and pelvic peritoneum, or the patient's general health may suffer seriously from the long-continued suppuration and purulent discharge.

The septum can be divided with scissors without much risk of hemorrhage even during labor, when it offers, or seems likely to offer, any serious obstacle to delivery, or in the non-pregnant female when intercourse is difficult or conception impossible.

E. *Faulty Communications with Other Cavities.*—If it be remembered that in the embryo the urogenital tube and the intestinal tube terminate in a common conduit—the cloaca, a depression on the external surface of the ovum,—the genesis of the abnormalities in question is easily explicable. In the normal course of development a septum (completed in the tenth week of intra-uterine existence) divides the urogenital sinus in front from the rectum behind. If this septum does not appear the cloaca persists, there is no anus, and apparently the rectum empties into the vagina a short distance above the hymen. To this condition the strange name atresia ani vaginalis has been accorded; while if the communication is below the hymen, it is called atresia ani hymenalis or vestibularis. The simple term persistent cloaca would more accurately describe both abnormalities. The opening of the intestinal canal into the cloaca may be small, and, if not actually possessing a sphincter, may yet be able to resist the involuntary passage of fæces and flatus, which are voided periodically and at will. If the communication be large, however, the patient suffers from those symptoms which characterize the more extensive forms of perineal laceration.

Numerous other abnormal communications have been observed, as, for example, an opening from the vagina into the normally formed rectum, from the vagina into the urethra or bladder, or between a ureter and the vagina. Again, the ileum, colon, and vagina have been found opening upon the surface of an extroverted bladder.

The sinus urogenitalis may persist as a long and narrow passage, so that the urethra opens, apparently, not into the vestibule, but into the vagina.

The causes of these faulty communications are largely arrests in development occasioned by fœtal inflammatory processes; but in the production of persistent cloaca (atresia ani vaginalis or vestibularis) hereditary influence seems to have some force, since this condition has been known to have been present in several members of the same family.

For the relief of this last condition the perineum should be divided from before backward, the end of the intestine is to be sutured in the middle of the incision thus made, and the remainder of the wound closed by stitches. The abnormal opening into the vagina will often close spontaneously.

F. *Blind Canals or Inversions of Vaginal Mucous Membrane.*—Occasionally lacunæ of the vagina attain unusual dimensions and are recognized as blind tubes, sometimes large and long enough to admit the little finger, lined with smooth mucous membrane and lying parallel to the long axis of the vagina, or they are deflected into the perivaginal connective tissue. The point of exit of these tubes is usually near the vaginal outlet at the sides of the columna ruga posterior.