

RECENT ADVANCES  
IN THE  
DIAGNOSIS AND TREATMENT  
OF  
FEMALE STERILITY

RAYMOND E. WATKINS, M. D.  
903 COBRETT BUILDING

PORTLAND, OREGON  
From the Department of Gynecology, Uni-  
versity of Oregon Medical School.

RECENT ADVANCES IN THE DIAGNOSIS  
AND TREATMENT OF FEMALE  
STERILITY

RAYMOND E. WATKINS, M. D.  
PORTLAND, OREGON

From the Department of Gynecology, University of  
Oregon Medical School

A great deal of research work has been done in the last few years with the idea of improving our knowledge of the treatment of sterility. This work has been prompted largely by the fact that there are so many sterile matings in the United States. One in every ten marriages is a barren union. It has been estimated that there are two million sterile couples in this country at the present time. Often the greatest regret in a man's or woman's life is the fact that they have no children. Of equal importance is the decrease in our native-born population. This decrease is said to be steadily growing. The subject, therefore, is of a great deal of importance and deserves careful study by all who have to deal with this problem.

Female sterility may be classified as follows: (1) Primary, when a woman living in normal sexual relations has never conceived. It is customary to refer to primary sterility when a union has remained unfruitful for three years or longer. (2) Secondary sterility occurs when a woman becomes sterile from acquired causes after having previously conceived—the so-called one child sterility. This is often the result of infections after labor, or occurs in a woman who was healthy at the time of marriage but later contracts a venereal infection from her husband. (a) Sterility is said to be absolute when the cause cannot be removed. (b) Sterility is relative when due to infertility on the part of the male or to a condition of the female which can be corrected.

Nearly always the unhappy wife in a barren mating is blamed for the sterility. The husband is reluctant to shoulder the responsibility. He sometimes resents the inference that he might be the one at fault and may balk at investigation. Yet statistics ac-

ording to Meaker, MacComber, Hunner and others show that 20 to 50 per cent of sterility is due to infertility of the male. It is important, therefore, to bear in mind that the male is very often at fault and it should be our first duty in the study of a case of sterility to find out whether or not the male partner is fertile.

A review of the normal mechanism concerned in fertilization will be advantageous. The seminal pool is normally deposited so as to be in relation to the external os. Suction by the cervix takes place, as the spermatazoa are to be found in the cervical canal immediately after intercourse, if examination of the cervical mucus is made. During intercourse the cervical mucosa pours out an alkaline mucous secretion which not only tends to neutralize the acid vaginal secretion but offers ropes of mucus as a pathway for the sperms to travel upward toward the fundus. There is thought to be an increase in the endometrial secretion. The sperm passes on to the fundus, having been found in the cervix six days after coitus.

Inasmuch as the union of the spermatazoa and the ovum normally takes place in the outer part of the fallopian tube, the sperm must be able to make its way to this point unobstructed. Likewise a healthy ovum must be produced which should have a free passageway and be capable of passing through the fallopian tube from the ovary to the uterus. Lastly, this ovum must find an endometrium suitable for its implantation and development. It will be seen, then, that there are three important essentials concerned in sterility. First, there must be a healthy spermatazoa; second, there must be a healthy ovum; and, third, there must be a healthy patent canal from the vaginal orifice to the ovary. The fertilized seed must have suitable soil in which to grow.

To determine the cause of female sterility may in some be a simple matter, while in others it is a complex problem. The analysis of a large number of cases is perhaps of some value. Guy Hunner, in a study of 526 instances, made the following observations regarding the etiology: Cervical discharge 33 per cent, acid cervical leucorrhoea 14 per cent, pelvic infections 15 per cent, retrodisplacements 14 per cent, cervical stenosis 10 per cent, ammenorrhoea 7 per cent, developmental abnormalities 8 per cent, painful intercourse 5 per cent, uterine

fibroids 5 per cent, no cause found 8 per cent.

In 279 patients examined, out of 526, the husband was found to be sterile in 56 or 20 per cent. MacComber in a study of 337 instances classifies his findings differently. Under what he calls functional classification he found that inflammatory conditions caused 30 per cent, congestive conditions 23 per cent, developmental errors 24 per cent, ovarian disorders 23 per cent.

In summarizing he gives the following figures: Male sterility caused 50 per cent. Female sterility was analyzed as follows: Pathologic conditions caused 50 per cent, of which 25 per cent were due to closed fallopian tubes and 25 per cent were due to chronic congestion in some part of the tract. The other 50 per cent showed 25 per cent due to faulty development and the other 25 per cent to ovarian disorders.

He also analyzes one-child sterilities in 76 patients. His findings differ here, in that there were no developmental disorders, but he found 55 per cent due to congestive conditions, whereas in primary sterility only 25 per cent were due to this cause. The increase in this class he found to be due to lacerations, subinvolution and relaxed pelvic supports.

If you will consult any standard textbook on gynecology, you will find given as a cause of female sterility practically everything from elephantiasis of the labia to carcinoma of the ovary. There is such an array of causes given that in the study of a patient the physician may become confused, and his attention directed to some one condition which may only have slight bearing on the cause, if any at all, and the real trouble be overlooked. Among the numerous etiologic factors given there are certain causes worthy of emphasis and discussion.

Infection and its results stand first and foremost as a cause. Particularly is this true, when it affects the cervix causing endocervicitis. Inflammation changes the normal alkaline cervical mucus to a purulent discharge which blocks the way. Not only does this discharge block the way but it has a toxic effect on the gonads and they die quickly, when they come in contact with this purulent matter.

It is not unusual to find cervical strictures, particularly at the internal os, and there is practically always an associated endocervicitis. The stricture is the result of long standing inflammation. Chronic infections at the vaginal orifice affect the Bartholin glands and Skene's ducts. Curtis believes that chronic infections at these points are of great importance, in that they act as constant foci to infections higher up in the genital tract.

Infections of the fallopian tubes cause distortion, adhesions and closure. Infections of the ovary interfere with its function by thickening of the capsule or enveloping adhesions, preventing the normal rupture of the Graafian follicles and the escape of the ovum. The type of organism producing the infection we are not always able to determine, but undoubtedly gonorrhea plays an important role in that it has a predilection for mucous surfaces and is prone to produce destruction of mucous surfaces with resulting adhesions.

Another important cause is ovarian dysfunction, whether due to faulty development, infections or constitutional disorders, such as syphilis, obesity, or alcoholism.

Displacements of the uterus seem to exert some causative influence, particularly ante-flexion. Here we often find an associated underdevelopment of the uterine body with a sharp angle of flexion of the cervix at the internal os, displacing the external os up under the symphysis. There is frequently an associated passive congestion of the endocervix with a secondary endocervicitis complicating. This condition is not only a developmental fault but a mechanical error as well.

Fibroids and polypi act as a cause, when they interfere mechanically with the lumen of this tract.

Unusual acid vaginal secretion is practically always given as an important cause. Inasmuch as the vaginal secretion is normally acid, there has always been a question in my mind as to whether the fault does not lie in the fact that the cervical secretion is changed and becomes hostile. It has been quite definitely proven that the normal vaginal secretion kills the spermatazoa in from one to two hours.

Faulty development may be responsible in a number of ways, as the short anterior

vaginal wall, the underdeveloped cervix and uterine body; diverticula and kinks, with arrested development of the fallopian tubes; the hypoplastic or underdeveloped ovary. Fetalism is purposely not discussed.

It is interesting to note the work of Reynolds and MacComber. They have experimented extensively with rats, using diets deficient in certain elements. The results show that a diet deficient in calcium influences the fertility of the individual. Rats previously fertile become sterile. The calcium restored to their diet makes them again fertile. During the recent war, when some elements of food were scarce in Europe, it was noted that there was a tendency for many women to be sterile. A properly balanced diet is significant and we should be on the lookout for signs of malnutrition.

Reynolds and MacComber have also shown that there is a wide range of difference in the degree of fertility of rats, some being highly fertile, while others are of low or medium degree. If a mating of two of low fertility occurs, conception is not likely to take place, while if one of high fertility is mated to one of low fertility conception often takes place. It must be admitted that there is a wide range of difference between the laboratory rat and the human being, but there are numerous examples of degrees of fertility in men and women to bear out their conclusions. Couples have separated, each remarried and each has had children by a new mate.

Obesity has long been known to be associated with sterility. It may or may not be secondary to an endocrine disturbance. Endocrinologists have reported numbers of cases of obesity, due to thyroid and pituitary disturbances, which were not only sterile, but had amenorrhea and, when by proper treatment the weight was reduced, menstruation was again established and in some cases pregnancy occurred. Obesity is not always an endocrine disorder and can often be overcome by proper diet. Many cases of sterility have been reported cured by the reduction of weight to normal with no other treatment for sterility, conception taking place shortly after the normal weight was attained.

Temperamental incompatibility acts as a factor in influencing the cervical and vaginal secretions. A woman's receptiveness

stimulates a greater flow of alkaline cervical secretion which neutralizes the acid vaginal mucus and thereby acts to preserve the life of the spermatazoa. Sexual indulgence at too frequent intervals is thought to be detrimental in that there are produced spermatazoa of low vitality. MacComber states that chronic congestion of the servix also results from excessive coitus. Cervical congestion, he thinks, is a frequent cause of sterility.

Incompatibility between certain uterine secretions and spermatazoa may account for many unexplainable childless unions. It is possible that there is the same enmity here as found when typing the blood of different persons. Van der Dyck found that the serum of fertile females belongs to a group which agglutinates the erythrocytes of all other groups and believes that the property of agglutination bears a direct relationship to sterility.

Stapler reported fourteen cases in which pregnancy followed tonsillectomy in previously sterile young women. In all these patients the tonsils were infected and there was an associated menstrual irregularity. He believes because of the more or less direct connection of the tonsil to the hypophyseal and thyroid glands, that the tonsil has an endocrine effect on gonad secretion and sex functioning in both male and female.

Dyspareunia or painful intercourse as well as vaginismus, if they prevent intercourse, are so apparent as causes that they hardly call for more than mention.

#### DIAGNOSIS

In considering the diagnosis of sterility one should follow a definite plan. It is quite as important to be able to tell the patient that conception is impossible as it is to do otherwise. With this knowledge that they may reconcile themselves to their fate and perhaps adopt a child to take the place of their own. A complete history should be taken and in addition to other questions we should inquire into whether the patient has had symptoms of gonorrhea or prostabortal infections. A carefully taken menstrual history gives us some idea of the function of the ovary.

Physical examination should be complete. One should search for foci of infection, anemia, malnutrition or endocrine disturbance. The weight should be observed and the general development as regards sec-

ondary sex characteristics. Pelvic examination will reveal any gross abnormalities. Vaginal examination should include the inspection and stripping of Skene's ducts, examination of Bartholin's glands, the vagina and cervix. The reaction of vaginal and cervical secretions should be ascertained. The position of the cervix, its size and shape, the type of opening of the external os, the presence of endocervicitis must all be determined. Particular attention should be paid to presence of a cervical plug of mucus and the presence or absence of cervical stricture. Bimanual examination determines the position of the uterus, its shape, size, consistency and mobility. The presence of growths is ascertained. The fallopian tubes are next examined as to abnormalities and bimanual palpation of the ovaries reveals their condition.

Presuming that we have found no absolute barrier to conception, it is our next duty to find out whether or not the male is fertile. The method of Huhner is now quite generally accepted. The cervical mucus is secured within one or two hours after intercourse by the use of a pipette inserted into the cervical canal and examined microscopically for living motile spermatazoa. This secretion is diluted with a few drops of warm saline solution and should show four to sixteen motile spermatazoa to a field. Vaginal examination of secretion cannot be relied on. If the sperm is found in the cervical secretion as stated above, the male may be classed as normal. Should none be found a condom specimen examined within two hours and kept at body heat will conclusively show the presence or absence of living motile spermatazoa in sufficient numbers. Should none be found, the examination should be repeated after a few days, thus proving the male may be sterile. If the condom specimen yields normal spermatazoa, we must look to the female for the cause of our trouble. I have never looked for spermatazoa in the fundus, as has been suggested by one writer.

If no abnormality is found in the genital tract of the female, our next problem is to ascertain whether or not the fallopian tubes are open. In 1919 an ingenious investigator by the name of Rubin perfected an apparatus for forcing gas through the uterus and fallopian tubes to determine whether or not the tubes were patent. Oxygen was first

used, later carbon dioxide, as it was found that oxygen was slowly absorbed and caused considerable pain. Carbon dioxide is absorbed more rapidly. Of late many are using air for inflation with no ill effect.

The procedure can be carried out in the office and the patient may go to her home, after fifteen to thirty minutes with little, if any discomfort, as obviously only a small amount of gas or air need be passed in order to determine the patency. The modified apparatus consists of a hand bulb to force the air, a manometer to measure the amount of pressure and a canula with a rubber flange to insert through the cervix into the uterus. In patent cases the pressure rises to between 60 and 100 mm., then drops to 20 or 50 mm., as the air passes through the tube. A stethoscope placed above the symphysis reveals a soft whistling sound as the air escapes in the abdomen. When the patient gets up, pain in the shoulder is noticed but this soon goes away. In the nonpatent cases 200 mm. of pressure may be accepted as evidence of non-patency. This pressure should be repeated three or four times at each test. Meaker advised six tests before making a diagnosis of occlusion and states that several pregnancies have occurred after the attempt was made with apparent failure to force gas through. The Rubin test is contraindicated at or near the menstrual time, in the presence of acute pelvic inflammatory disease or serious heart disease. The simplicity of this method lends itself to practical use.

Operations for the relief of sterility should not be done without a preliminary patency test, as it is impossible to tell by palpation whether or not the fallopian tubes are open. The finer lesions will escape notice by bimanual palpation even under anesthesia while the one important point, tubal obstruction, can be definitely determined by trans-uterine insufflation. Another point which seems quite definitely established is that this test has some therapeutic value, in that a number of pregnancies have been reported following its use. It has the possibility of breaking up light adhesions and re-establishing patency. This test should be used in carefully selected cases, the indications strictly observed and careful asepsis carried out.

I have used the Rubin test, using air instead of carbon dioxide or oxygen for test-

ing the patency of the fallopian tubes fifteen times with no ill effects. In only one patient was there any unusual disturbance. This was a case of closed tubes in a middle aged woman who had had chronic pelvic pain, extending over a long period of time. There was a history of pulmonary tuberculosis preceding the onset of the pelvic trouble. Examination showed the uterus to be somewhat fixed with no appreciable enlargement but considerable tenderness of both adnexa. The test was used in this instance as a diagnostic measure to determine whether or not there had been an inflammatory condition of the tubes with resulting closure. This patient remained in bed for several days following the insufflation because of acute pain through the pelvis, but recovered without any further disturbance.

It is interesting to note that in another patient in whom air could not be forced through at 200 mm. of pressure, thirty days later, this time having given the patient 30 minims of benzyl benzoate every four hours for a day preceding, the air went through at a pressure of 140 mm. The use of benzyl benzoate for this purpose was suggested by a recent writer.

#### TREATMENT

Leaving out gross lesions which absolutely bar conception and defy correction, we must treat cases that are at all possible of cure with due regard to lesions causing sterility. The patient with obesity due to dietary errors must have her food restricted so that she will attain her normal weight. Endocrine disorders causing obesity and amenorrhea should be given proper glandular therapy. In malnutrition our treatment should consist of building up the patient to a normal condition. Focal infections, if found to be a factor, should be removed. Systemic diseases should be given their proper type of treatment.

Our patient should be instructed regarding the sexual act. In some cases abstaining from the coitus for long periods has been of value, or advising intercourse just before and after the menstrual period with none between. The weak alkaline douche taken just before intercourse is occasionally useful. Elevating the hips or taking the knee chest position fifteen minutes after coitus has been followed by happy results.

Infections of Skene's tubules or Bartholin's glands must be cured. Endocervicitis with or without erosion should be eradicated. Treatment by the use of iodine, mercurochrome or silver nitrate applied at intervals to cervical mucosa will cure many simple cases. The actual cautery, using a nasal tip and cauterizing small linear areas at intervals of several days often helps the more severe cases.

A persistent endocervicitis which does not yield to the above measures must be dealt with by eradicating the cervical mucous membrane. The method of Sturmdorf is simple and gives satisfactory results. Amputation of the cervix is not a good procedure here because it frequently in itself produces sterility and, should pregnancy occur, there is likely to be dystocia at the time of labor. This is not true of the Sturmdorf operation which consists in removing a core of cervical mucosa to the internal os and turning in a cuff of the stratified squamous vaginal mucosa which is carried up and covers the denuded area. This procedure permanently cures endocervicitis.

Strictures in the cervical canal are found by passing a sound. They are located most often at the internal os and should be gradually dilated until they remain open. A case recently seen by primary sterility of four years duration conceived immediately after this procedure and is now six months pregnant. Needless to say, the passing of sounds should be done under the strictest aseptic precautions.

Displacements of the uterus which are movable should be replaced and held in correct position by a suitable pessary. Operative replacement of the retrodisplaced uterus in the absence of any symptoms referable to the displacement except sterility is not warranted, in my opinion. The cause of the sterility is probably due to infective lesions that are associated.

Curetage has been given credit for curing sterility in many cases. The procedure should be condemned for it has dangerous possibilities. It may produce an infection of the endometrium which at times travels to the fallopian tubes, causing closure and thus renders a woman sterile who was potentially capable of pregnancy. The value of this procedure, if any, seems to be in the dilation of the cervical canal, a preliminary

necessary to passing the curette into the fundus of the uterus.

When the anterior vaginal wall is short with the cervix pulled up under the symphysis, as we frequently see in cases of ante-flexion, the condition may be corrected by making a transverse incision in the vaginal wall about one and one-half inches in length just anterior to the cervix and, after freeing the fibers of the pubocervical ligament which are attached to the anterior lip of the cervix, the incision is closed longitudinally. This lengthens the anterior wall and allows the cervix to drop back into its proper position.

The cervix may be dilated at the same time if stenosed, or the pin hole enlarged by such procedure as the Pozzi operation. This consists in making an incision in either side of the cervix after the manner of a bilateral laceration and sewing the edges of the wound together in the opposite way. This leaves a gaping opening when healed. Another procedure is the Dudley operation, in which the incision is carried through the posterior lip backward. A wedge is removed and the resulting wound repaired in such a way as to enlarge the opening of the external os. Either of these procedures gives the cervical canal better drainage and this is an advantage where there is a passive congestion.

Fibroids affecting the lumen of the uterine canal usually produce symptoms which themselves call for relief. In operating, if practical, we should choose a procedure that will allow an opportunity for pregnancy. A myomectomy can often be done where there is a single fibroid or a small number and their removal will not produce too much damage to the uterus.

In surgery of the closed tubes a good deal of judgment is required to say when and when not to operate. Not only the findings should be considered, but the history of the case is here very important. Repeated attacks of acute inflammation either gonorrhoeal or postabortal usually mean extensive destruction and irreparable damage. Curtis, who has done much investigative work with infections of the tubes, states that single mild attacks of either postabortal or gonorrhoeal salpingitis are favorable to operative relief. At operation the freeing of adhesions should be done by careful blunt dissection. The tubes are inflated from within the abdomen by inserting a Luer syringe into the fimbriated end of the tube and attempting to force air through into the uterus, following the method described by Curtis.

The distended tube will show points of obstruction and of bands of adhesions constricting the lumen. Probing the tube is likely to damage the mucous membrane and may produce false passages through the walls. By inflation we can determine whether or not the tubes are patent and worthy of preservation. A salpingostomy may be advisable and should be done in cases where a portion of the tube must be sacrificed.

In dealing with the ovaries any adhesions surrounding them should be removed. Pro-lapsed ovaries are better suspended. Resection of a portion of the ovary may be advisable in some cases of cystic disease.

Artificial insemination or the injection of semen into the uterus is recommended by some and has been done many times in the past with an occasional successful result. It is not, however, free from danger. Normally the seminal fluid does not reach the uterine cavity, the spermatazoa traveling to this point by their own motility. Quite a few cases of tubal infection have been observed, following attempts at artificial impregnation. This method of treatment is occasionally justifiable in carefully selected cases of cervical obstruction but not a procedure to be tried as a routine.

In conclusion, may I say that we are not justified in doing any surgery for the relief of sterility unless we have first definitely established that the husband is fertile; second, eradicated infections of the lower genital tract and; third, determined by the Rubin test whether or not the fallopian tubes are patent.

#### BIBLIOGRAPHY

- Kaplowitz, A: *Med. Jour. and Rec.*, Mar., 1924.  
 Meaker: *Bost. M. and S. Jour.*  
 Curtis, A. H.: *Am. J. Obst. and Gyn.*, July, 1924.  
 MacComber, D.: *Bost. M. and S. Jour.*, May 10, 1923.  
 Dabney, M. Y.: *Sout. Med. Jour.*, Dec., 1922.  
 Frank, R. T.: *Kan. Med. Jour.*, May, 1924.  
 Reynolds and McComber: *Bost. M. and S. Jour.*, March, 1922.  
 MacComber, D.: *Jour. A. M. A.*, April, 1923.  
 MacComber, D.: *Bost. M. and S. Jour.*, Sept., 1922.  
 Hirst, B. C.: *Am. J. Obst. and Gyn.*, Aug., 1922.  
 Dickenson: *Am. J. Obst. and Gyn.*, Aug., 1922.  
 Watkins, T. J.: *Prac. Med. Series*, 1923.  
 Curtis, A. H.: *Jour. A. M. A.*, Feb., 1923.  
 Hunner, Guy and Wharton: *Sout. Med. Jour.*, Apr., 1924.  
 Jacoby, A.: *Surg. Gyn. and Obst.*, Apr., 1923.  
 903 Corbett Building.