TUBERCULOSIS OF THE FEMALE GENITAL TRACT

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Clinical features and communicability of tuberculosis were known before 1000 BC, however, the term was used for the first time in 1834, almost half a century before Koch, in 1882, discovered the tubercle bacillus.

The etiologic agent of no other major disease has infected so many people as that of tuberculosis which is still considered the most important communicable disease in the world. In the United States, mortality from tuberculosis has declined sharply from 194.1 to 6.1 per 100,000 cases during the years 1900–1960. Nevertheless, an estimated 35 million people in this country have positive reactions to tuberculin and, presumably, have been infected with tuberculosis. The 10,000 Americans who die from tuberculosis annually refute any claim that the disease has been eradicated. And, it has been estimated that nearly one-half of India's almost 250 million people have tuberculosis; one person dies of this disease every minute with an annual loss of over 500,000 lives.

The fact that tuberculosis can affect any organ in the body, can exist without manifesting clinical signs or symptoms and can recur apparently after being arrested, makes it important that the protean nature of this disease be understood. Moreover, during the past 20 years, advances in medical and surgical treatment of tuberculosis have altered the concept of treating and managing the patient with tuberculosis.

Morgagni, in the mid-eighteenth century, was the first person to describe genital tuberculosis. In the female, this disease is considered to be merely one manifestation of a generalized invasion of the body by tubercle bacilli; the genital lesions are secondary to tuberculosis elsewhere, usually, the lungs.

* From Davis' Gynecology and Obstetrics. Medical Department, Harper & Row, Publishers. (In press.)

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During the past 2 decades, reports on genital tuberculosis have increased in the literature. No doubt, the increased use of the following laboratory procedures accounts for the more precise detection of the disease in more patients:

a. endometrial curettage and biopsy  
b. histologic examination of curettings and serial sections of fallopian tubes  
c. uterosalpinography for investigating genital disorders  
d. bacteriologic methods, especially examination of menstrual blood for tuberele bacilli  
e. laparoscopy to diagnose pelvic disorders

Perhaps, just as important, has been the increased awareness by the gynecologist that:

a. tuberculosis does occur in the genital tract  
b. the disease may exist without clinical signs and symptoms  
c. tuberculosis may be the cause of infertility in about 5 percent or more of women who seek help at sterility clinics.

INCIDENCE

The actual frequency of genital tuberculosis in the general population cannot be determined accurately. In many patients, it is discovered incidentally, and in a large number of symptomless patients, this disease remains "undiscovered." The estimates of frequency of genital tuberculosis have been based on postmortem examinations, surgical specimens and endometrial biopsies from sterility studies. Obviously, any data collected from selective material cannot indicate true incidence. Moreover, there are wide variations in figures published in different countries.

In Women Who Died From Pulmonary Tuberculosis

In postmortem studies, we found an 81 percent incidence of genital tuberculosis among women who died from pulmonary tuberculosis. Other investigators have reported incidences of between 4 and 12 percent. Careful histologic examination of the fallopian tubes by serial section, increased the frequency with which genital tuberculosis was diagnosed at autopsy, from 7.7 to 20 percent. Since fewer deaths from tuberculosis are now being reported as compared with previous years, and since early treatment of pulmonary tuberculosis with antituberculosis drugs is now widespread, involvement of the female genital organs should be observed less frequently in future postmortem studies.
In Tubes Removed Surgically

In adnexa that had been examined after surgical removal, the frequency with which genital tuberculosis was found varied between 2 and 20 percent. The use of antibiotics to treat pelvic infection has greatly reduced the number of patients requiring operative treatment in the chronic stage. However, the extent to which antibiotics are used for inflammatory disease varies in different countries and in individual clinics. Furthermore, the care with which the excised tubes are examined histologically in different laboratories is an important and variable factor in determining the incidence of tuberculous salpingitis.

In Sterile Patients

As reported from infertility clinics throughout the world, the incidence of genital tuberculosis averages between 5 and 10 percent with a low of less than 1 percent in Australia and a high of 19 percent in India. In the European, Scandinavian and South American countries and Israel, the incidence of genital tuberculosis, usually discovered in the endometrium on routine curettage or biopsy, is high. In the United States and Australia, the reported incidence is less than 1 percent. In sterile women who complained of amenorrhea, the incidence of endometrial tuberculosis was 51 percent in India, whereas in Germany, the incidence of amenorrhea in patients with genital tuberculosis was 0.4 percent. In a study of 2581 infertile women in India, Malkani reported that 9.84 percent had endometrial tuberculosis.

The reported incidence of genital tuberculosis in patients operated on for sterility is higher when tubes are examined rather than only the endometrium. Mannheimer reported that 13 percent of 239 patients in a series had tuberculous salpingitis. Sharman believed that among sterile patients whose tubes were closed, 25 percent had tuberculous salpingitis; Halbrecht showed that in patients with primary infertility and tubal occlusion, 44 percent had tuberculous salpingitis.

In Patients with Pulmonary Lesions

It is generally agreed that genital tuberculosis in the female is one of the secondary manifestations of tuberculosis which, in the large majority of cases, has its primary site in the lungs. Accordingly, one might expect to find a history of a tuberculous pulmonary lesion
or radiologic evidence of tuberculosis in many patients with genital tuberculosis. However, this is not always true, (Table 1).

| Author    | Number of patients with genital tuberculosis | Percentage with pulmonary tuberculosis |
|-----------|---------------------------------------------|--------------------------------------|
| Hagen     | 28                                          |                                      |
| Jedberg   | 186                                         | 24                                   |
| Lahman    | 21                                          | 20                                   |
| Liejedahl | 148                                         | 49                                   |
| Peterson  | 100                                         | 25                                   |
| Schaefer  | 44                                          | 29                                   |
| Sutherland|                                             | 9                                    |
| Wegener   |                                             | 41                                   |
| Ylinen    |                                             | 15                                   |

The data in Table 1 indicate that in many instances the pulmonary lesion either was not recognized as tuberculosis or had been arrested and was not evident in X-ray films. Therefore, a normal or negative chest X-ray should not rule out the possibility of genital tuberculosis. Inactive pulmonary lesions are demonstrable in about one-third of the patients who have genital tuberculosis. Before the era of anti-tuberculosis drugs, a small number of patients (5-10 percent) with active pulmonary tuberculosis also were found to have genital tuberculosis. The number of cases depended on whether or not a pelvic examination was performed, and bacteriologic or microscopic examinations were carried out.

**In Patients with Extrapulmonary Lesions**

In patients with genital tuberculosis, the extrapulmonary and extragenital organs or systems most frequently involved are the peritoneum, the pleura, lymph nodes, skin, bones and joints, kidneys and intestines. In most instances, these extragenital lesions have healed, and their earlier manifestations are revealed only by a careful history. A patient usually does not recall a transitory skin lesion or pleurisy in childhood, particularly if neither disorder was diagnosed originally as tuberculous in origin. Approximately one-third of our patients with genital tuberculosis at The New York Hospital had extrapulmonary lesions.

With the exception of the skin and intestines, extrapulmonary
organs also become involved in tuberculosis by hematogenous spread, so that in some instances the disease may coexist in these and the genital organs. Coexistence occurs most frequently in the kidneys and peritoneum.

**Coexisting Genital and Peritoneal Tuberculosis**

Whether the tuberculous infection spreads from tubes to the peritoneum, or from peritoneum to the tubes, or whether both involvements are a result of the same or successive hematogenous seedings, still is unanswered. Tuberculous peritonitis, like genital tuberculosis, is not a primary disease. It may result from a miliary spread, or it may originate from a tuberculous focus in the intestines or mesenteric lymph nodes. In some instances, it may be part of a polyserositis and coexist with tuberculous infection in the pleura and pericardium.

Tuberculous peritonitis is seen in combination with genital tuberculosis in about 45 percent of the cases. Jedberg believes that the spread of infection from the peritoneum to the tubes is not common. Although Snaith and Barns concurred with most authors that tuberculosis is disseminated to the pelvis by the hematogenous route in 90 percent of the cases, they thought that retrograde spread of infection from genitals to peritoneum is possible. After puberty, tuberculous peritonitis has been observed more frequently in females than in males. The consensus is that tuberculous lesions in the genital tract and in the peritoneum should be regarded as separate sites of localization from a common origin, usually the lungs.

**Coexisting Renal and Genital Tuberculosis**

In the past, the incidence of combined renal and genital tuberculosis in women was found to be less than 5 percent. Recently, a group of Russian investigators reported that the association of renal and genital tuberculosis was more frequent in their experience than had been reported previously. They found coincident infection of the urinary tract in 30 percent of 184 women with genital tuberculosis (35). This emphasizes the importance of frequent and systematic urologic examination in women with genital tuberculosis.

**In Patients with Other Lesions**

We have seen both benign and malignant lesions of the genital organs coincident with genital tuberculosis. Conditions, such as endometriosis, uterine myomata, ovarian cysts, paraovarian cysts and car-
cinoma of the cervix, have been found in patients with tuberculous salpingitis. In many instances, the exact nature of these lesions cannot be determined preoperatively. Ylén found the above lesions plus carcinoma of the fallopian tubes and of the vulva in 12 percent of the patients on whom surgery was performed. In only one-fifth of the 41 patients who underwent surgery, was genital tuberculosis suspected preoperatively.

LOCALIZATION

Frequency of Tuberculous Involvement of Various Organs

The frequency with which the various organs of the genital tract are involved by tuberculosis is shown in Table 2.

| Organ   | Percent |
|---------|---------|
| Tubes   | 90–100  |
| Uterus  | 50–60   |
| Ovaries | 20–30   |
| Cervix  | 5–15    |
| Vagina  | 1       |

Both tubes are diseased because the tubercle bacillus tends to attack each bilateral organ in succession. The uterus is infected in at least one-half of the cases, and the infection is nearly always in the endometrium, seldom in the myometrium. In actively functioning endometrium, all or most of the infected tissue may be shed during menstruation; the endometrium is repeatedly reinfected from the tubes. The ovaries are affected in more than one-quarter of the women with genital tuberculosis, but their involvement is thought to be by direct extension to the cortex of the ovary. Cervical involvement was reported in less than 10 percent of the cases in most series, until Nogales and Vilas showed that the cervix was involved in 25 percent of the patients in their series at the University Clinic in Madrid. Tuberculosis of the vagina or of a Bartholin's gland has been reported infrequently.

Age

About 80–90 percent of the cases of genital tuberculosis are first diagnosed in patients between the ages of 20–40 years. Frequently,
the discovery is made during investigation for infertility. However, the disease probably exists for many years before it is detected and in all likelihood is present soon after the initial pulmonary infection. Occasionally tuberculosis is first discovered after it causes postmenopausal bleeding.

PATOIOGENESIS

Two types of infection of female organs have been described: primary and secondary.

Primary Infection

Most pathologists state that primary infection of the female genital organs does not occur. It is known that tuberculous foci may exist in the body and remain undetected for a long time. These lesions may precede the genital lesions and heal without leaving evident traces on clinical examination. Two criteria are necessary for a diagnosis of primary genital tuberculosis: 1. lesions should be the first tuberculous infection in the body and 2. tuberculous development in the regional lymph nodes should be at the same stage as that in the genital organs. According to Auerbach, no such cases have ever been described in the literature he reviewed.

Tuberculosis of the vulva or vagina, without demonstrable evidence of tuberculosis in the upper genital tract, has been reported as a primary lesion. This type of disease may occur in a woman who has tuberculosis of another organ, and who excretes tubercle bacilli in her stool, urine or sputum. When they come in contact with the external genitalia, these excretions may produce tuberculosis of the vulva or vagina, particularly if the skin is abraded or broken. This cannot be considered a primary infection of the genitalia, since a pre-existing focus is present in some other part of the body.

On rare occasions, genital infection of the woman following coitus with a husband who has a tuberculous lesion of the genitourinary tract has been reported. The resultant lesions were in the external genitalia, involved the area of the fourchette and occurred if the skin in this area was broken.

Secondary Infection

With the rare exceptions cited earlier in this article, genital tuberculosis is always secondary to tuberculosis elsewhere in the patient's body, usually the lungs. Infection can occur via the bloodstream, lymph system, or by direct extension from a neighboring organ.
Hematogenous spread

In most cases, after the lung has been invaded by tubercle bacilli, they are disseminated via the bloodstream within a matter of hours and are deposited in various organs of the body. This bacillemia may persist for 6 weeks or longer if the disease is not recognized and treated promptly with antituberculosis drugs. No organ or tissue is immune from attack by this bacillus, although there are marked differences in the frequency with which various organs are infected. These differences are due to the degree to which each organ is directly exposed to the bacilli, to mechanical factors that influence the extent to which bacilli will lodge in each organ and, in part, to the ability of different tissues to support the bacilli that do lodge in them.

Tubercle bacilli also may reach the bloodstream from extra-pulmonary and chronic pulmonary lesions and multiply in the genital organs. The tube forms a most favorable nidus for tubercle bacilli, the earliest lesions being found in the mucosa. The tendency of the tubercle bacillus to affect bilateral organs results in both tubes being involved in the tuberculous process.

Lymphatic spread

Lymphatic spread, a less common mode of infection, occurs when the primary lesion is in the abdominal cavity. In some countries where people still drink raw milk, infection by bovine tubercle bacilli through the alimentary tract is still reported. In one area of Hungary, 33 percent of the cases of female genital tuberculosis were due to bovine bacillus, as reported by Gravallér, Surányi and Berenési. The bacilli are then spread to the tubes via the lymphatics.

Direct spread from a neighboring viscus

Direct extension to the genital organs from tuberculous abdominal viscera, such as the bladder, rectum, appendix and intestines, has been described. Some researchers believe this spread occurs along the peritoneal surface. It may also occur when adhesions bind the bladder or intestine to the tubes; perforation of a tuberculous ulcer results in a direct spread to the genital organs.

Mode of spread from tubes

After the initial involvement of the tubes, the tuberculous infection spreads to the uterus and ovaries by direct extension. Evidence of this is seen in the decreasing involvement from tubes to cervix and by the fact that the tuberculous process shows a progressive decrease in intensity from above downward. Extension in the uterus is along
the endometrium and rarely into the myometrium. Hematogenous spread directly to the uterus as a part of generalized hematogenous tuberculosis rarely has been reported.

The ovaries may be involved by direct infection from a neighboring structure. In most instances, this infection spreads from the tube and extends to the surface of the ovaries. Only rarely, the infection extends from the peritoneum to the ovary. Hematogenous spread to the ovary without tuberculous perioophoritis has been described. In such instances, the center of the ovary is involved, and the periphery appears normal. Although this type of ovarian involvement is rare, it must be considered when a decision to retain the ovaries is made during surgery.

An interesting theory for the selective involvement of fallopian tubes by tubercle bacilli has been postulated by Knaus. He states that the earliest focus of genital tuberculosis in the male is the epididymis just as the fallopian tubes are in the female. Knaus recommends early removal of the tuberculous tubes, because, in his opinion, this prevents extension to the other pelvic viscera and cures the genital tuberculosis.

The cervix is involved by spread from the endometrium or as part of the hematogenous infection. Tuberculous infection of the vagina and vulva may follow injury or abrasions to these structures in the presence of tubercle bacilli from the upper genital tract, intestinal tract or lungs.

Dellepiane states that the use of antituberculosis drugs has tended to change the clinical picture of the disease, resulting in a decreased incidence of acute forms and an increased incidence of subacute and chronic forms. On the basis of 965 cases of genital tuberculosis in which the pathogenesis could be defined precisely by a series of clinical, laboratory, roentgenologic and laparoscopic procedures, he describes genital tuberculosis as primary in 0.2 percent, as hematogenous in 59.2 percent and as descending in 40.6 percent. The latter occurs via the lymphatics from the lungs to the intestinal lymph nodes and to the tubes.

**PATHOLOGY**

*Pelvic Tuberculosis*

Pelvic tuberculosis may exist as tuberculous adenitis, either of the mesenteric or of the pelvic lymph nodes, without involvement of the genital organs. Also, a generalized miliary peritoneal tuberculosis in
which greyish-white tubercles stud the abdomen may involve the serosal surface of both abdominal and pelvic organs without penetrating to the mucosa. Few adhesions are present, and such superficial lesions do not impair the reproductive function of the pelvic organs. It is in the presence of this type of lesion that “pregnancy following pelvic tuberculosis” frequently has been described. It should be emphasized that “pelvic tuberculosis” is not the same disease as the genital tuberculosis described below.

Genital Tuberculosis as Seen at Operation

The gross appearance of genital tuberculosis seen during surgery may resemble chronic pelvic inflammatory disease due to gonorrhea or other nontuberculous bacteria. Unless tubercles and caseation are evident grossly, tuberculous salpingitis may simulate pyosalpinx, chronic interstitial salpingitis or salpingitis isthmica nodosa. Tuberculous lesions are in a process of progression or healing and changes are continually taking place that produce different stages of the same pathologic process in the same patient. Secondary infection of the tuberculous lesion by Bacterium coli or other organisms may further mask any distinctive characteristics.

When gross lesions are present, an inflammatory exudate may fill the entire pelvis and obscure all pelvic organs. In advanced disease, the tubes, ovaries, uterus, mesentery and intestines often are firmly matted together. Foci of caseation varying in size from a few millimeters to a centimeter or larger, may be found on the various pelvic organs, intestines, omentum and peritoneum. If the condition has been present for a long time and attempts at healing have taken place, calcified white plaques may be seen.

When antituberculosis drugs have been used preoperatively, the adhesions are not as dense, and the organs are more movable. Marked hyperemia and vascular engorgement are often seen following antimicrobial therapy. In early stages of genital tuberculosis, involvement of the tubes is minimal, and the serosal surfaces as well as the diameter of the tube may appear normal during surgery. Diagnosis is made from microscopic examination which shows tubercles in the mucosa of the tube, at times extending into the muscle walls.

Tuberculosis of the Fallopian Tubes

In more than 90 percent of the patients with genital tuberculosis, the tubes are involved bilaterally. Even though only one tube appears infected, there probably are microscopic lesions in the other. Rich
has pointed out that the tubercle bacillus attacks each bilateral organ in succession, and for this reason the lesions in the tubes are not always of comparable extent. In the early stages, the tubes show little change, but as progression occurs, the diameter of the tube becomes larger. Usually, the abdominal portion shows the earliest and most extensive changes: the fimbrial processes become greatly swollen and the ostia remain open or closed. In chronic gonorrheal salpingitis, the fimbriated ends of the tubes almost invariably are closed.

The isthmus and the adjacent interstitial portion of the tube may remain free of tuberculosis. One or more swellings may occur along the tube which assumes a nodular appearance. As the process continues, the tubes become softer and caseation develops in the inner wall.

Two types of salpingitis have been described: exudative and productive-adhesive.

**Exudative**

The size of the tube may reach tremendous proportions in exudative salpingitis. Although a large pyosalpinx may form, these tubes show few adhesions and, from the surgeon's view point, are mobile. Frequently, the organs contain a large amount of caseous material as well as purulent exudate from secondary infection. This is a relatively acute phase of the process. Hematosalpinx and hydrosalpinx also may be found in the more chronic cases.

**Productive-Adhesive**

In productive-adhesive salpingitis, which is found most frequently during surgery, the tubes are studded with tubercles and are densely adherent to the surrounding organs. The tubercles are most closely packed near the attachment of the tube to the mesosalpinx. The tube wall is thickened, and the serosa may be hemorrhagic. The tubes are only slightly swollen.

Both forms of salpingitis may be different stages of a continuing tuberculous process which at first distends the tube with caseation and, as progression continues, results in marked adhesions and matting of the tubes to the surrounding structures. Further healing results in calcification and fibrosis (Fig 1).

**Microscopic Appearance**

Tuberculous lesions in the tubes present the same microscopic picture as that seen in other organs, but confusion may occur in inter-
pretation because of the peculiar anatomy of the tubes. Auerbach describes the development as the formation of tubercles in the wall of the tube. Some have a caseous center which, as they progress, involve the overlying mucous membrane or cause pressure atrophy. After liquefaction, the caseous foci pour their bacilli into the lumen and form an ulcer at the site. The ulcer is lined by caseation or a pyogenic membrane; beyond the inner zone is an area of vascular granulation tissue containing epithelioid and giant cells. Adhesions of the individual folds may occur resulting in large cystic spaces—“pseudofollicular salpingitis.” Numerous folds in the mucous membrane are ideal for further extension of the process. When healing occurs, calcium deposits, hyalinization and increased fibrous tissue may be seen (Fig 2). In chronic tuberculous salpingitis, the microscopic picture may resemble that of nonspecific salpingitis and, unless multiple sections are taken, the tuberculous lesion may be missed.

**Tuberculosis of the Uterus**

Grossly, the size and shape of the uterus may appear normal. The tuberculous process generally is localized to the endometrium, is most extensive in the fundus and decreases towards the cervix. The myometrium frequently is not involved. Although the endometrium may appear normal, shallow yellow ulcers, particularly near the cornu and often in continuity with similar changes in the tube, have been

![Fig 1. Gross lesions of tuberculous salpingitis. Right tube is distended and contains caseous exudate. Left tube is smaller and shows areas of fibrosis and calcification. Uterus and ovaries did not show evidence of tuberculosis on microscopic examination. (From Schaefer (25).)](image-url)
Fig 2. Tuberculous salpingitis. This section shows several stages of healing. C, Caseation; Y, Hyalinization; K, Calcification; E, Loosening of an epithelioid tubercle; R, Transformation into reticulum. [From Schaefer (26).]

described. When extensive involvement of the uterus occurs, the appearance resembles carcinoma. Coexistence of carcinoma and tuberculosis of the uterus has been described.

Tuberculosis of the endometrium resembles tuberculosis in other tissue, but the advanced stages—caseation, fibrosis and calcification—rarely are seen during the reproductive period because of the regular shedding of endometrium at menstruation. Tubercles and giant cells frequently are found in curettings, but giant cells are not always indicative of tuberculosis. Most often the endometrial lesion consists of circumscribed lesions of endothelioid cells surrounded by a zone of lymphocytes and plasma cells. These inflammatory cells may be present in the stroma without focal lesions (Fig 3).

The findings in the endometrium in unsuspected cases of tuberculous endometritis have been described by Sutherland. On histologic examination the picture is one of infrequent, usually isolated, small tubercles scattered irregularly through the endometrium. In most cases, the lesions are extremely scanty, and careful search through
a slide of all the endometrium removed at curettage may reveal only one or two foci of tuberculosis (Fig 4).

Tuberculosis of the Ovary

The ovaries are involved in genital tuberculosis in about 25–30 percent of the patients. Usually the involvement is bilateral, although this cannot always be recognized during surgery. Two forms of ovarian tuberculosis are described: periophoritis, in which infection occurs from without, and oophoritis, in which the infection starts in the stroma of the ovary, presumably from a hematogenous source.

Periophoritis

Extension of the tuberculous process from the tube involves the ovary in a tubo-ovarian mass which is frequently adherent toomentum and intestines. This is the most common form of tuberculous involvement of the ovary, and the resulting lesion is that of periophoritis, with extension from the periphery toward the center. It
has been postulated that the "toughness" of the tunica albuginea prevents extension of tuberculosis to the ovary, accounting for the less frequent infection of the ovary compared to the tube.

**Oophoritis**

Oophoritis is rare and follows hematogenous spread. Typical tubercles or larger foci with caseous centers may be recognized on cross section in the hilum of the ovary. If the question of removing a normal appearing ovary at surgery arises, it is well to bisect the ovary before making the decision. If no caseous foci are present to the naked eye, the ovary may be retained, and the patient is given a postoperative course of antituberculosis drugs for 18 months.

**Tuberculosis of the Cervix**

The usual incidence of cervical involvement in genital tuberculosis is 5–15 percent. However, Nogales and Vilar believe it is more com-

*Fig 4. Endometrial tuberculosis. Solitary tubercle with giant cell as seen in upper right corner. Endometrium is in the proliferative phase. [From Schaefer and Birnbaum (29).]*
mon, especially in the endocervix where it frequently is overlooked. No typical gross lesion of tuberculosis of the cervix can be described. The most common type is the ulcerous, although papillomatous and miliary forms also may occur. The diagnosis can be made with certainty only by histologic or bacteriologic examination. It is suggested that if bacteriologic examination for tuberculosis of endocervical mucous of all patients with infertility problems were a routine procedure, these cases of tuberculous cervicitis would be discovered (10).

Tuberculosis of Vulva and Vagina

This is the rarest form of genital tuberculosis and occurs in less than 2 percent of the cases. Grossly these lesions differ somewhat from those seen in the internal genitalia. Rather than tubercles and caseation, one sees small, shallow ulcers, multiple sinus tracts and scarring. Occasionally, pale granulation tissue and yellow nodules are present. Tuberculosis of a Bartholin's gland is rare.

DIAGNOSIS

Clinical Aspects

Success in arriving at a correct preoperative diagnosis of female genital tuberculosis is contingent on the systematic and persistent application of both clinical findings and laboratory tests. As in the diagnosis of other conditions which the physician does not encounter frequently, a high index of suspicion is perhaps as important as any diagnostic procedure. The five most frequent symptoms are shown in Table 3. Although none of these symptoms is specific for genital tuberculosis, and indeed the patient may have no complaints and

| Presenting symptom          | Frequency (%) |
|-----------------------------|--------------|
| 1. Sterility                | 45–55        |
| 2. Pelvic pain              | 50           |
| 3. Poor general condition   | 26           |
| 4. Menstrual disturbances   | 20           |
| 5. Vaginal discharge        | 4            |
seek advice only because of infertility, if she does present 3 or more of these symptoms, a thorough examination for genital tuberculosis is warranted.

Table 4 shows the usual order in which we investigate the patient suspected of having genital tuberculosis.

| Table 4. Order of Examinations in Female Genital Tuberculosis |
|-------------------------------------------------------------|
| 1. Family history                                           |
| 2. Past history                                             |
| 3. Physical examination                                    |
| 4. Chest roentgenogram                                      |
| 5. Tuberculin test                                          |
| 6. Endometrial curettage                                    |
|   a. Histologic examination                                 |
|   b. Bacteriologic examination                              |
| 7. Menstrual blood examination                              |
| 8. Hysterosalpingogram                                      |
| 9. Laparoscopy, culdoscopy                                  |

Other investigators may follow a different order of examination. Some clinicians do an endometrial biopsy and then a hysterosalpingography. Surányi et al begin with bacteriologic examinations of premenstrual secretions, menstrual blood and material aspirated from pelvic abscesses. Kraübig prefers frequent and repeated bacteriologic examinations of menstrual blood and expresses the belief that “. . . hysterosalpingography and endometrial biopsy are not always indicated.” Halbrecht performs repeated cultures of menstrual blood and endometrial biopsy: if these are negative, complete curettage, and only then, hysterosalpingography are done.

**History**

**Family**

About 20 percent of patients with genital tuberculosis give a history of tuberculosis in their immediate family. As a rule, they were exposed to a tuberculous adult during childhood.

**Past**

Possibly because it was mild or transient, or because the term “tuberculosis” was not associated with it, the patient may be unaware
of and may even deny a past history of tuberculosis. Yet, approximately 50 percent of our patients have had tuberculous pleurisy, peritonitis, erythema nodosum or renal, osseous or pulmonary tuberculosis. In many of these patients, the condition was diagnosed as idiopathic and the exact etiology never determined. Some of our patients were operated on for appendicitis in childhood and a review of the pathologic findings occasionally reveals a tuberculous appendix. Table 5 shows the frequency of earlier tuberculous manifestations found by several other authors.

Table 5. Previous Tuberculosis from Past History

| Earlier tuberculous manifestations | Percent |
|-----------------------------------|---------|
|                                   | Ylinen | Jedberg | Sutherland |
| Pleurisy                          | 38     | 25      | 25         |
| Peritonitis                       | 28     | 13      | 29         |
| Pulmonary tuberculosis            | 15     | 24      | 9          |
| Erythema nodosum                  | 8      | 15      |            |
| Osseous tuberculosis              | 4      | 5       | 4          |
| Renal tuberculosis                | 1      |         | 0.4        |

INFERTILITY

A history of primary sterility in a woman in whom examination reveals no apparent cause and who gives a family history or past history of tuberculosis, should arouse suspicion of genital tuberculosis. Approximately 85 percent of patients with genital tuberculosis have never been pregnant: of the remaining 15 percent, one-third to one-half develop symptoms of genital tuberculosis within one year after their last delivery. The average incidence of genital tuberculosis in infertility clinics throughout the world is 5–10 percent, and varies from 0.69 percent in Australia to 17.4 percent in India.

Symptoms

PELVIC PAIN

The most common symptom of female genital tuberculosis is pelvic pain. It occurs in about one-half the patients and usually has been present for several months before the patient sees a gynecologist. The pain
is not severe and may be accompanied by swelling of the abdomen, although episodes of acute lower abdominal pain due to secondary infection by pyogenic organisms may intervene. When progression of genital tuberculosis takes place, pelvic pain becomes more severe and is aggravated by coitus, exercise and the menses.

**General malaise**

A history of poor general health persisting over a period of months or years and associated with weight loss, undue fatigue, low-grade fever or vague lower abdominal pain, often is elicited in patients with genital tuberculosis. Some patients also give a history of pelvic inflammatory disease that has not responded to the usual antibiotic therapy.

**Menstrual disorders**

Abnormal uterine bleeding in genital tuberculosis has been reported in from 10–40 percent of patients. Menorrhagia and metrorrhagia are not more common in tuberculosis than in other gynecologic disorders. Postmenopausal bleeding has been reported in slightly over 2 percent of patients and usually was associated with endometrial tuberculosis although myomas, adenomyosis or polyps have been concomitant findings in some cases.

Disturbances of menstruation in genital tuberculosis do not follow the same pattern in different countries. Ylinen noted no menstrual irregularities in 56 percent of his patients in Finland; Kirchhoff described normal menstrual cycles in 62 percent of his patients in Germany; and Sutherland and Garrey found no menstrual abnormalities in 46 percent of their patients in Scotland. In contrast, Aldea, Filipescu and Cristea found normal menstruation in only 7.3 percent of their patients in Rumania, and Malkani and Rajani reported amenorrhea in from 18–53 percent of their patients, depending on the section of India in which the patients lived.

There has been some speculation as to the cause of the amenorrhea. It is well known that advanced, active, pulmonary tuberculosis may produce amenorrhea, particularly if associated with fever and weight loss; yet, active pulmonary tuberculosis is rarely found concomitantly with active genital tuberculosis. Complete destruction of the ovary by genital tuberculosis seldom occurs, so that ovarian failure is not the cause of amenorrhea. The most likely explanation is that given by Malkani and by Nogales and Villar who attributed the amenorrhea to end-organ failure secondary to endometrial eacation.
Physical Examination

Physical examination is important in establishing a diagnosis of genital tuberculosis. However, it should be emphasized that no abnormal findings may be apparent, or at best, only vague ones.

Abdominal Findings

Palpation of the abdomen may reveal a "doughy" sensation which has been ascribed to tubercle formation on the intestines and peritoneum. Ascites, either general or sacculated, may produce distention of the abdomen. Irregular masses caused by the matting together of intestines, omentum and pelvic organs may be palpated. When large tuberculous tubo-ovarian masses are present, deep pressure on the lower abdomen elicits dull pain rather than the sharp pain found in gonorrheal or streptococcal infections.

Pelvic Findings

On bimanual examination, the fallopian tubes may not be enlarged. Adnexal masses, if present, vary in size from a slightly thickened, irregular tube to a large tubo-ovarian mass. Usually the consistency of the mass is not uniform and both firm and fluctuant areas can be palpated. Tuberculous tubo-ovarian masses are less tender than those due to pyogenic disease, although secondary infection and acute exacerbations may produce sharp pain and acute tenderness. Other pelvic lesions such as fibromyomas, ovarian cysts or adenomyosis, as well as cervical cancer, may coexist with genital tuberculosis. The presence of bilateral tubo-ovarian masses in a virgin who has a history of pulmonary or extrapulmonary tuberculosis should make the examiner highly suspicious of genital tuberculosis.

Laboratory Aids in Diagnosis

Chest X-ray

A chest roentgenogram should be studied for evidence of healed as well as active pulmonary tuberculosis. With few exceptions, all tuberculosis starts in the lungs and spreads to other parts of the body. Careful evaluation of the chest roentgenogram by a trained phthisiologist is imperative, for small or healed lesions are frequently overlooked. A negative chest roentgenogram does not rule out the possibility of genital tuberculosis, for the original pulmonary lesion may have healed by the time the genital lesion manifests itself.
Signs of earlier pleurisy are of particular significance, since pleural effusion in young people may be assumed to be tuberculous.

Tuberculin Test

This test consists of the intracutaneous injection of first strength purified protein derivative (PPD) on the flexor surface of the forearm. If after 48 hours the transverse diameter of edema and redness measures 10mm or more, the result is considered positive. This test is most important in ruling out tuberculosis as a cause of genital lesions, for a negative reaction indicates that the patient does not have tuberculosis. (The tuberculin test should not be done in the presence of fever, pregnancy, influenza, brucellosis or measles, since these conditions may produce temporarily false negative reactions.) A positive tuberculin test does not differentiate pulmonary from extrapulmonary tuberculosis but signifies only that the patient has been sensitized to the foreign protein of the tubercle bacillus. It has been suggested that women who have a positive tuberculin test and unexplained abdominal disorders, should have repeated examinations of menstrual blood for tubercle bacilli.

Endometrial Curettage

Histologic examination

The histologic examination of endometrial tissue removed by either curettage or biopsy affords a rapid method of diagnosing genital tuberculosis in at least one-half of the cases. Demonstration of tuberculous endometritis may be assumed to indicate tuberculous salpingitis in practically 100 percent of the cases. The question as to whether a curettage or biopsy be performed, is frequently raised. Some authorities advise doing a biopsy first and, if this is negative, a complete curettage in the next menstrual cycle. Some allege, that curettage increases the risk of reactivating a latent tuberculous lesion; others believe that it is not the curettage but rather the dilatation of the cervix that may initiate hematogenous spread.

Pathologists who must examine the tissue prefer a curettage specimen, because more tissue is available for examination and a negative curettage is more significant than a negative biopsy. One negative biopsy or one negative curettage does not exclude the diagnosis of genital tuberculosis. The microscopic diagnosis of endometrial tuberculosis from a typical tubercle showing giant cells, epithelioid cells and areas of caseation is not difficult. However, atypical lesions in
the form of lymphocytic islets of various sizes without specific character require repeated examinations and confirmation by bacteriologic studies.

The best time for examining the endometrium is several days before the expected menstrual period at which time the tubercles reach their maximum growth. The portion of the endometrium most likely to show tubercles is in the region of the uterine cornua where spread from the tube first occurs. Because of the periodic shedding of the endometrium, a mature tubercle does not always have time to develop, so that advanced stages of tuberculosis, such as caseation, fibrosis and calcification as seen in other organs, are seldom present in the endometrium.

**Bacteriologic Examination**

Bacteriologic examination of part of the endometrium removed at curettage should be done, for this may be positive for tuberculosis when histologic examination is negative. The bacteriologic methods include: 1. direct microscopy for tubercle bacilli in smears, 2. culture and 3. animal inoculation. Direct smears are infrequently positive, since it has been estimated that approximately 100,000 mycobacteria per ml must be present in secretions to give a positive smear. Culture in Petragnani or Lowenstein media and guinea pig inoculation are more likely to give positive results. These examinations require a well-equipped laboratory and well-trained technicians. Although 6–8 weeks are required before a diagnosis can be made by bacteriologic examinations, they have the advantage of providing a definitive diagnosis and enabling determination of drug sensitivity.

**Examination of Menstrual Blood**

Bacteriologic examination of menstrual blood and of uterine or cervical secretions has been useful in diagnosing female genital tuberculosis. The two foremost proponents of this method are Halbrecht and Kirchhoff. Halbrecht states that cultures may be negative as many as nine times and positive the tenth time. He emphasizes the importance of repeated examinations performed by highly trained technicians. Bugna found that guinea pig inoculation of menstrual blood gave a higher rate of positive results for tubercle bacilli than did cultures. Kirchhoff also reiterates the importance of a well-trained bacteriologist for menstrual blood examinations and agrees that guinea pig inoculation is more reliable than culture. Menstrual blood may be collected through a vaginal speculum on the first or second day of the cycle or by fitting the patient with a cervical cup and having her collect all the menstrual blood and transfer it to a sterile bottle.
It should be remembered that there are acid-fast organisms other than *Mycobacterium tuberculosis*, and these occasionally may be mistaken for tubercle bacilli.

**Hysterosalpingography**

An absolute diagnosis of genital tuberculosis cannot be made from a hysterosalpingogram. However, completely or partially blocked tubes, found in the course of an investigation for sterility in a patient with extragenital tuberculosis, should lead one to consider the possibility of tuberculous salpingitis. If a water soluble contrast medium is used and the usual precautions governing uterosalpingography are observed, complications are infrequent and minimal. Hysterosalpingography has been used as a guide to determine the effect of therapy; tubes initially closed occasionally become patent after chemotherapy. Although X-ray lesions characteristic of tuberculosis of the tubes and uterus have been described, these should always be confirmed by histologic or bacteriologic examinations.

Rozin has described various abnormalities in the uterine cavity resulting from synechiae in uterine tuberculosis.

**Laparoscopy**

When diagnosis of the tuberculous origin of obstructed tubes cannot be established by other methods, or when persistence of latent tubal tuberculosis is in doubt, Palmer and Oliveira use laparoscopy and percelioscopic biopsies. From 1946–1962, they performed 99 tubal biopsies during celioscopy for suspected tuberculosis with negative endometrium and suspicious hysterosalpingograms. In 27 patients, mucosa was absent and biopsy was useless. Among the 72 remaining patients, active tuberculosis was found in 10, latent tuberculosis in 17, sequelae of healed tuberculosis in 7, sclerosis of the tubes of unestablished origin in 26 and various other diagnoses in 12.

Because of the danger of bowel adherent to the abdominal wall or in the cul-de-sac, we believe that laparoscopy and culdoscopy, except in the most experienced hands, is interdicted in the diagnosis of genital tuberculosis. The danger of bowel perforation or poor visualization of the tubes is ever present.

**Histologic Examination of the Tubes after Surgery**

Diagnosis of tuberculous salpingitis is sometimes made first by the pathologist after examining microscopic sections of the tubes removed
at surgery. Not only is the surgeon unaware of the presence of tuberculosis, but the pathologist may miss the diagnosis unless numerous sections from the entire tube are taken.

Presence of giant cells in a section of tube is not definitive evidence that the lesion is tuberculosis. Granulomatous lesions such as syphilis, actinomycosis and granuloma inguinale, may give rise to histologic changes that include giant cells. At times, giant cells may arise around foreign bodies introduced at the time of hysterosalpingography. Figure 5 shows giant cells due to foreign body reaction in a portion of a tube removed at tuboplasty. This section may be compared with giant cells from a tuberculous tube in Figure 6.

**TREATMENT**

**General Aspects**

In treating women with genital tuberculosis, it must be assumed that the genital lesions are merely a manifestation of a generalized systemic infection and their eradication should be based on the same
principles which have proved successful in curing tuberculosis elsewhere in the body. To plan effective treatment the gynecologist must consider the following:

1. Are active extragenital lesions present?
2. What is the extent of the genital lesions?
3. Will antimicrobial therapy cure genital tuberculosis?
4. In what type of case will surgery be necessary?
5. Is full-term pregnancy possible following treatment of genital tuberculosis?

Presence of active extragenital lesions

As a rule, active extragenital foci of tuberculosis rarely are present when the genital lesion is discovered. Usually the original pulmonary or extrapulmonary disease has been arrested. Routinely, a chest roentgenogram, repeated sputum or gastric analyses and examination of the urine for tubercle bacilli are performed.

An important starting point in treatment is to determine the sensitivity of the tubercle bacilli to the antimicrobial drugs—isoniazid, para-
aminosalicylic acid (PAS), and streptomycin, hence the importance of bacteriologic identification whenever possible.

Regardless of the type of treatment instituted, one must include general therapeutic measures such as mental and physical rest, proper nutrition, dietary supplements when indicated and careful personal hygiene. If no active extragenital lesions are discovered after antituberculosis drugs have been started, the patient may be treated on an ambulatory basis.

Extent of Tuberculosis in the Genital Organs

In 1955, I presented a simple classification of genital tuberculosis based on clinical evaluation as determined by bimanual examination. Comparison of our clinical findings with pathologic specimens removed during surgery has confirmed the value of this classification which is now in use in many centers. Two types of genital tuberculosis are differentiated: minimal and advanced.

1. Minimal

Minimal genital tuberculosis is usually asymptomatic except for sterility. Tubo-ovarian masses are not palpable although induration in the tubes may be present. Diagnosis is secured from the bacteriologic or microscopic finding of tuberculosis in the endometrium obtained by curettage or biopsy or from bacteriologic examination of menstrual blood.

2. Advanced

In advanced genital tuberculosis, palpable tubo-ovarian masses are present. Histologic or bacteriologic examination of the endometrium or menstrual blood reveals tuberculosis.

Antimicrobial Treatment

Drug regimens and duration of therapy that have been successful in the treatment of pulmonary and extrapulmonary lesions should be used in treating female genital tuberculosis. This entails continuous, long-term, combined drug therapy for a minimum of 2 years and, in some cases, a longer period. Unfortunately, papers reporting short-term antituberculosis therapy for female genital tuberculosis have appeared in the literature. A large percentage of patients treated in this manner had recurrence of active disease.

Malkani and Rajani used weekly biopsies to follow a series of 30 patients who were receiving antituberculosis drugs for the treatment of tuberculous endometritis. From the fourth week on, these patients showed an increasing number of histologically negative endometria,
and after 12 weeks the endometria in all 30 patients were negative. According to Kardos, tuberculous endometritis may be "cured" on histologic examination by antimicrobial therapy of 3 months duration, although he noted recurrence of endometritis after 4–5 years if the tubes were not removed. Tubercle bacilli have been found in menstrual blood after antimicrobial therapy. We reviewed 387 cases of tuberculous endometritis treated for periods as long as 4 months. These patients showed recurrence within 3 years in 22 percent of the cases. Moreover, even in those patients in whom the endometrium was apparently healed, the condition of the coexistent tuberculous salpingitis was not known. In order to determine the effect of antimicrobial therapy on the tubes and to arrive at the optimal duration of therapy, we treated a series of patients with genital tuberculosis for periods varying from 6 weeks to 3 years before removing the fallopian tubes. In patients with minimal genital tuberculosis, no evidence of active tuberculosis was found in the tubes after 10 months of therapy. Some tubes showed fibrous thickening of the stroma with fibrosis under the epithelial layers; in others a marked hypertrophy of the villus folds with fusion and pseudogland formation was seen. Following long-term therapy, the healing process reaches a stage where tuberculosis can no longer be recognized. Novak refers to this stage as chronic follicular salpingitis (Fig 7).

**Minimal Genital Tuberculosis**

For patients with minimal disease, we use the following regimen: isoniazid, 300 mg daily, orally, in three divided doses plus PAS, 12 Gm daily, orally, in three divided doses after meals. (If the sodium salt is used, 15 Gm daily are given.) At 6 months and again at 12 months after initiation of therapy, endometrial curettings or biopsies are examined bacteriologically and microscopically. If these are negative, a hysterosalpingogram is performed. Patency of the tubes is no guarantee that conception will take place. If, during the course of treatment, endometrial curettings become positive or tubo-ovarian masses appear, streptomycin is added for 3 months and then the patient is subjected to laparotomy. However, if no complications arise, we continue isoniazid and PAS for at least 2 years and then use isoniazid alone indefinitely. Some of our patients with infertility problems have been taking isoniazid for over 6 years.

**Advanced Genital Tuberculosis**

In patients with advanced genital tuberculosis, we use isoniazid, PAS and streptomycin. Isoniazid and PAS are given in the dosage
Fig 7. Fallopian tube after 5 months of antituberculosis therapy. V, There is a marked hypertrophy of the villous folds with pseudogland formation. W, Wall of tube. The lumen is markedly narrowed. No evidence of tuberculosis is present. [From Schaefer (26).]

outlined above. Streptomycin is administered intramuscularly in doses of 1 Gm daily for 4–6 weeks and then 1 Gm three times a week. We reexamine our patients every 2–3 weeks and have found that the adnexal masses become smaller for a period of almost 2 months, following which no further change occurs. If the tubo-ovarian masses are still present after 3–4 months of antimicrobial therapy, we operate on these patients. We do a total hysterectomy and bilateral salpingo-oophorectomy in all patients over 40 years of age. At present, on the basis of our findings in resected specimens, we believe that in younger women in whom it is desirable to retain menstrual function, the extent of surgery should be governed by the findings during surgery. The minimal surgery should be bilateral salpingectomy. At times, it is almost impossible to separate the ovary from the tubo-ovarian mass and in such instances the ovary should be removed. If one or both ovaries can be preserved, the uterus may be left in situ, provided one is certain that tuberculosis of that organ is not
present. In the era before antimicrobial therapy, failure to remove all tuberculous foci in the pelvis resulted in reactivation at a later date. Our experience has been that when such foci are small (less than 1 cm) they will regress if antimicrobial therapy is given for at least 2 years postoperatively. Following surgery, all three drugs are resumed. If all tuberculous foci have been removed, streptomycin may be discontinued one year after surgery. Isoniazid is continued indefinitely. Bulska, Chatys-Skirzynska and Ruszkowski state that conservative (antimicrobial drugs) treatment is not effective in advanced cases with adnexal masses. Their observations proved that antituberculosis drugs for periods of 6–12 months cured endometrial and endocervical tuberculosis but did not result in return to normal in patients with tuberculous salpingitis with clinical symptoms of tumors. They now give antituberculosis drugs for 12 weeks and follow this by bilateral salpingectomy, sometimes by salpingo-oophorectomy.

Kardos believes tuberculous foci in the adnexa should be removed if there is no clinical improvement after 6 months of chemotherapy. When caseous liquefaction is demonstrated, healing cannot be expected from chemotherapy, and in such cases, even if the tuberculous process is stabilized, “the post-tuberculous destroyed organs may later cause complaints which will require surgical intervention.”

**Additional treatment**

When bacterial resistance to streptomycin and isoniazid, or to all three primary drugs develops, reliance must be placed on combinations of one of the newer antituberculosis drugs—pyrazinamide, ethionamide, cycloserine, kanamycin, viomycin or ethambutol.

Ethambutol combined with one of the secondary drugs or with isoniazid is useful for pre and postoperative surgical coverage in drug-resistant patients. Ethambutol is given in doses of 15–25 mg/kg. After 60 days, the dosage can be lowered to 15 mg/kg. A single oral dose is given daily after breakfast. Some visual disturbances such as blurring or hazy vision, difficulty in reading, or inability to fully differentiate colors may occur. These changes, however, are completely reversible when ethambutol is discontinued and usually do not occur at all if the dosage is reduced after 60 days.

**Topical treatment**

Revelli employs topical treatment, either alone or in combination with systemic treatment. Topical treatment consists of endoperitoneal or uterotubal instillations and parametrial infiltrations according to
the site and stage of the tuberculous process. Cycles of 20–30 treatments are given two or three times per week. Drugs used are streptomycin (1 Gm), isoniazid (300 mg), cycloserine (250–500 mg), kanamycin (0.5–1 Gm) and rifamycin SV (125–250 mg) in water solution or suspension. To avoid irreversible fibroadhesive changes in the tubes, he uses antituberculosis drugs together with corticosteroids (prednisolone, 25–50 mg) topically by the vaginal route.

Surgery

Surgery for genital tuberculosis has been described as “radical” and “conservative.” Perhaps, better terms are “adequate” and “inadequate.” Adequate surgery may be anything from bilateral salpingectomy to total abdominal hysterectomy and bilateral salpingo-oophorectomy, the object being to remove all tuberculous foci in the pelvis. However, when genital tuberculosis is first discovered during surgery, overambitious attempts to remove all tuberculous tissue may lead to intestinal or bladder fistulas. In this type of case, all that should be done during surgery is to remove tissue for diagnosis. Antituberculosis drugs should be started immediately and administered for 3–4 months. Following this chemotherapy, removal of tuberculous lesions will be greatly simplified.

Surgery is indicated in the following situations:

1. Persistence or increase in size of adnexal masses after a course of antituberculosis drugs
2. Recurrence of endometrial tuberculosis after one year of antimicrobial therapy
3. Persistence of pelvic symptoms after long-term antituberculosis therapy
4. Patients over 40 years of age who will not continue long-term therapy and return for follow-up
5. Fistulas which fail to heal

While there are differences of opinion whether surgery is necessary in genital tuberculosis or whether surgery should be radical or conservative, there is agreement on the following points:

1. There is no valid reason to perform surgery in a woman known to have genital tuberculosis without a preoperative course of antituberculosis drugs.
2. Antituberculosis drugs should be given postoperatively for 18 months or longer.
3. Preoperative antimicrobial therapy makes the surgical procedure technically easier and reduces the risk of operative and postoperative complications.

4. Cure of genital tuberculosis is achieved more quickly with surgery than with antituberculosis drugs alone.

FULL-TERM PREGNANCY FOLLOWING TREATMENT OF GENITAL TUBERCULOSIS

There are conflicting views on whether successful pregnancy may be expected after treatment for female genital tuberculosis. One group which includes Ylinen and Kardos believes it rarely, if ever, occurs. The opposite view is held by Kirchoff, Snaith and Barns, and Revelli. Ylinen states that "... because of the difficulty of making an early diagnosis of genital tuberculosis, the prognosis for infertility seems nearly hopeless". Those who report successful pregnancies attribute these to early treatment with antituberculosis drugs and in some instances to the use of these drugs combined with steroid therapy.

Halbrecht gave 42 patients with bilateral tubal occlusion cortisone and antituberculosis drugs. Treatment consisted of daily administration of 50 mg of cortisone or 5 mg of prednisone (Meticorten), 250 mg of isoniazid, 12 Gm of PAS and one Gm of streptomycin, three times a week for 4 months. Following this regimen, 3 patients became pregnant—2 had intrauterine pregnancies and one had an ectopic pregnancy. Of 12 patients in this group who were subjected to tuboplastic surgery, none became pregnant. One explanation for a pregnancy resulting after proven genital tuberculosis is that one or both tubes may not be completely occluded. As Rich has pointed out, the tubercle bacillus attacks each bilateral organ in succession, so that the extent of the lesions in the tubes may not be comparable. It is estimated that if one or both tubes are patent at the start of treatment, the patient has a 5 percent chance of conceiving and delivering a live child.

In a review of over 7000 cases of genital tuberculosis from the literature. I found 155 full-term pregnancies, 67 abortions and 125 ectopic pregnancies. More than one-half of the cases of full-term pregnancy were not adequately documented. If we accept as proof of diagnosis of genital tuberculosis only histologic and/or bacteriologic examinations of uterine or tubal tissue or secretions, the 155 cases of successful pregnancy are reduced to 31. We believe, therefore, that although pregnancy may follow proven minimal genital tubercu-
nosis in some instances, patients with advanced disease should be considered permanently infertile.

My opinion, based on reports in the literature and on my own experience, is that the patient should be informed that successful pregnancy is unlikely following tuboplastic surgery in genital tuberculosis and should be made aware of the possibility of complications. In no circumstances should tubal reconstruction surgery be attempted until the patient has been treated with antituberculosis drugs for at least 2 years and the disease is considered arrested for at least 18 months.

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