Chapter 7
NONMALIGNANT TUMORS OF THE UTERUS

Nonmalignant tumors of the uterus comprise myoma (including adeno-myoma) and a miscellaneous group composed of other types, such as lipoma and the growths arising from remnants of the wolffian duct extending into the uterine wall.

MYOMA OF UTERUS

Myoma of the uterus is a tumor composed of muscular and fibrous tissue. It is often spoken of as uterine "fibromyoma" and as uterine "fibroid." As Mallory has pointed out, it is a true tumor of muscle tissue, and the term "myoma" is the accurate designation.

Uterine myoma occurs more frequently than any other tumor in women. Kolb found that it was present in 20 per cent of women over thirty-five years of age and in 50 per cent of all women over fifty years old. Gusserow found 38 per cent occurred between the ages of thirty and forty years.

The tumors vary in size from minute pea-sized nodules to the myomatous mass weighing 89 pounds reported by Cullen. Beacham et al. recently reported one weighing 55 pounds.

Etiology

Age.—Though myomas may occur at any age, their highest incidence of occurrence is in middle life during the active sex and reproductive years. Torpin, Pund, and Peoples in a series of 1,741 cases of myoma found the highest incidence in white patients to be between the ages of 37 and 46 years and in Negro patients between the ages of 29 and 42 years. The high incidence during the period of life when hormonal secretion is at its peak and the fact that myomas are more frequent in nulliparous women led Moench to suggest that the persistent estrogenic stimulation of the uterus in the absence of pregnancy was an etiologic factor. Later Witherspoon found that hyperplasia of the endometrium was present in 55 per cent of his cases of myoma. He felt that since excessive estrogen had been shown to be a factor in the production of endometrial hyperplasia, his findings confirmed the theory of Moench. He also suggested that chronic pelvic infection played an important part in the excess production of the estrogens. Although this work was confirmed by numerous workers, more recent series in which the criteria of Cullen and of Novak and Martzloff were used in making the diagnosis of hyperplasia, have definitely discounted this high incidence of association. Brewer and Jones in a careful histologic study of 100 cases of myomas found the cystic glandular hyperplasia present in only one case and Torpin et al. found it to be present

in 20 per cent of 200 white patients and in 10 per cent of Negro patients with fibromyomatous uteri. These percentages are considerably lower than the incidence in cases with other pelvic lesions.

An experimental approach to the problem was made by Nelson. By continuous administration of large doses of estrogens in guinea pigs he produced fibromyomatous growths in and about the uterus and throughout the abdominal cavity in six cases. There was an associated hyperplasia of the endometrium and hyperkeratinization of the cervical squamous epithelium. This work was amply confirmed by Lipschütz and his associates, who showed further that the development of these tumors could be inhibited by simultaneous administration of progesterone or testosterone. Similar tumors have been produced in rabbits by Moricard and Cauchoix.

It has since been shown that these experimental tumors are almost entirely made up of fibrous tissue and are not typical myomas nor do they commonly develop in the uterus. Nelson in his article emphasized the danger of applying the findings in experimental animals to those in the human being.

Brewer and Jones in a study of the corpora lutea and the endometria of patients with fibromas found that the ovarian-endometrial relationship was not significantly altered and that there was no evidence of excessive or unopposed estrogen stimulation.

A somewhat different approach to the problem is found in the work of Moracci, in a study of the utilization and elimination of estrogens of exogenous origin, in patients with myomatous uteri. Instead of determining the gross estrogen in the body fluids of myomatous patients, he administered 20,000 units of estradiol benzoate intramuscularly and determined the urinary content of estriol twenty-four hours before the injection and at regular intervals from twelve to seventy-two hours after the injection. The level of secretion in the myomatous women reached its maximum later than in normal women and this secretory level was also lower than that in the controls. In the normal women the excretion of the estriol returned to its initial level in seventy-two hours but in the myomatous patients a level higher than the initial level persisted well past seventy-two hours. Moracci feels that this tendency to retention, or to incomplete or delayed elimination of the estriol, points to a disturbance of estrogen metabolism in patients with myomas. Though the importance of estrogen stimulation is still not proved, this work of Moracci shows that there is an altered hormone balance in these cases.

Shute found an incidence of 63 per cent of hypothyroidism in myoma cases.

Abernathy in 1825 suggested that effused blood might be the cause of tumor development and in 1924 Bell attributed uterine myomas and mammary adenomas to bleeding from the tissue capillaries. Marshall feels that blood from an injured blood vessel has a chemotrophic reaction, causing an overproduction of fibroblasts which in turn produce the uterine fibroid. He was able to produce fibroid tumors in his own thigh by intramuscular injection of blood, but these were not myomas.

Race.—It has always been known that myomas are more frequent in the Negro race; in the series reported by Torpin et al. the figures are corrected for existing ratio of whites to Negroes in the local population. This corrected

ratio of incidence in the white to that in the Negro is 1 to 3.3. Figures reported from various southern centers are much higher. Torpin feels that the tendency of this race to develop keloids and large fibrous tumors in cases with lymphogranuloma may be a factor in their greater tendency to develop fibromyomas. The incidence of tumors larger than 5 cm. was one and one-half times that of such tumors in the white race.

Heredity.—Incidences of myomas in closely related individuals have, I am sure, been noted by many workers, though there are few reports in the literature. In my own practice I can recall several incidences where a mother and daughter have had myomas, and one pair of twins who had tumors of approximately the same size. Winkler reports myomas in three sisters. Because of the frequency of myomas in the general population and the fact that even with close relatives their specific disease entities are seldom discussed, the heredity factor is difficult to prove.
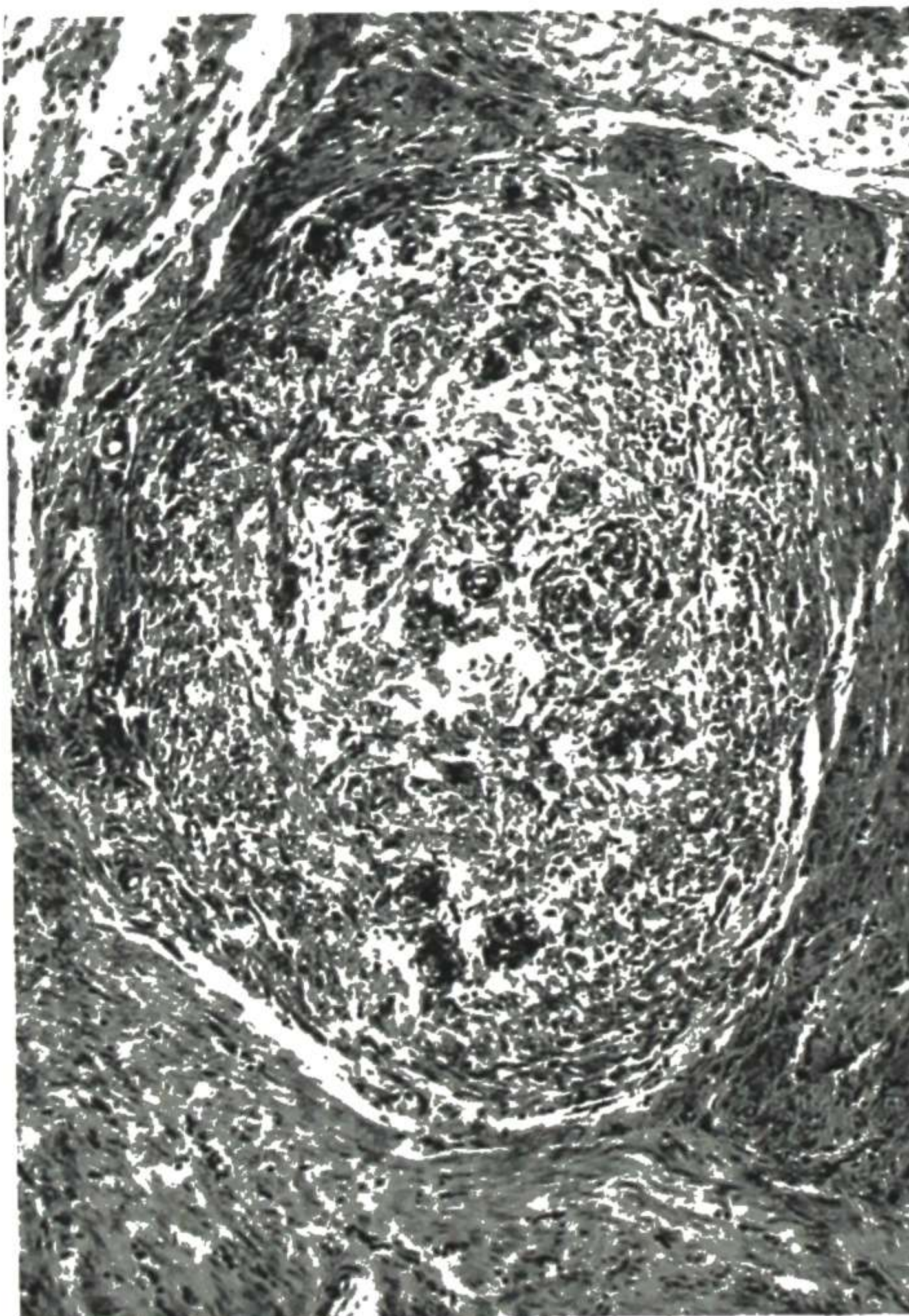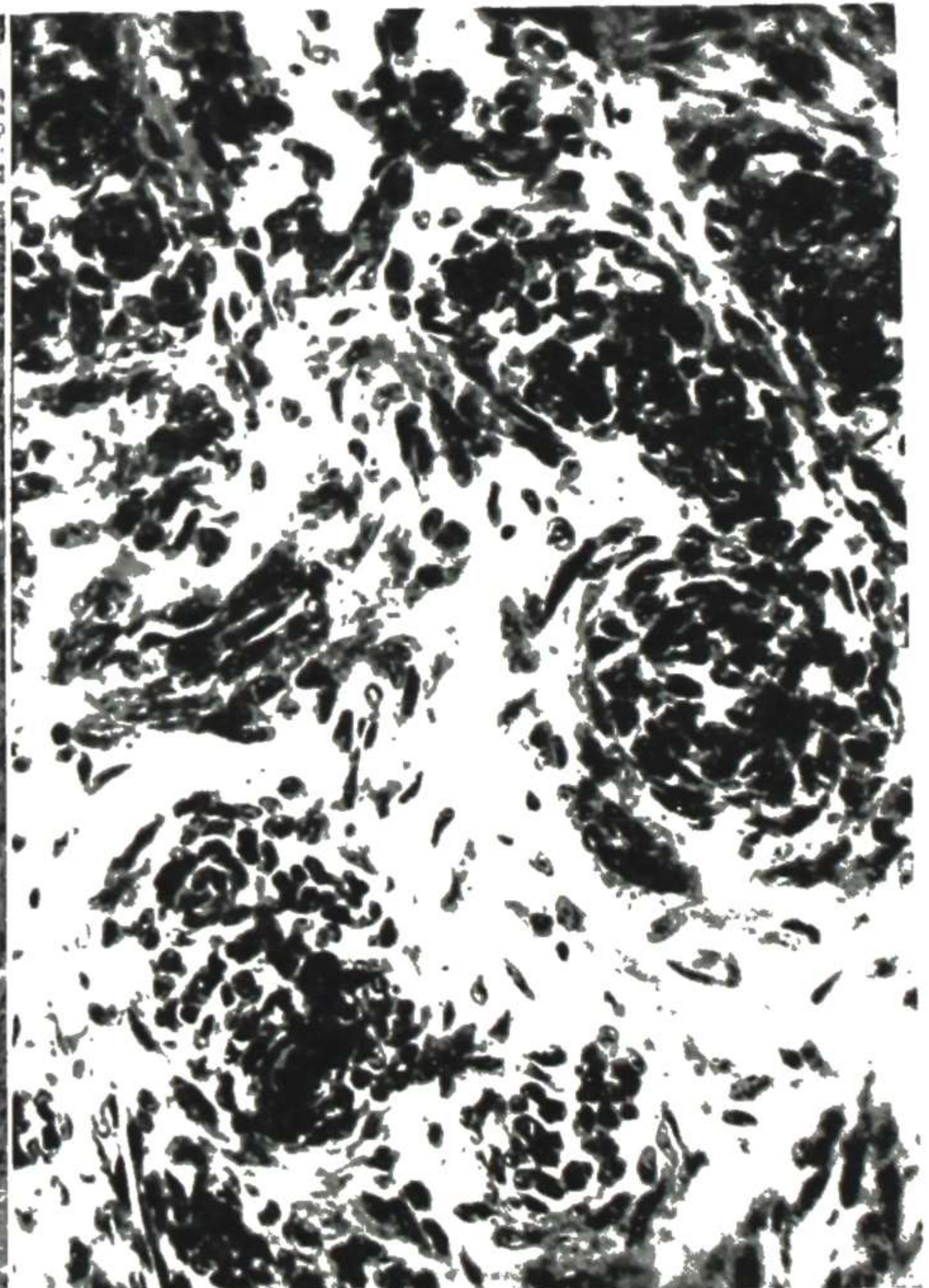

Fig. 585.   Fig. 586.

Fig. 585.—Shows a small very cellular myoma, 0.4 mm. in diameter, clearly encapsulated. The darker areas with cells in concentric arrangement have their origin from very small arteries.

Fig. 586.—High power of Fig. 585. Lumina of vessels in concentric areas are readily compressed, but note that the lumen is quite apparent in a slightly larger vessel in lower center of picture.

(From Schwarz and Wissner: Am. J. Obst. & Gynec., December, 1949.)

Cell Derivation.—Virchow believed that any muscle fiber in the uterus could, as a result of unknown stimulation, form a myoma. Ribbert's idea was that only certain fibers, which were not in complete growth-equilibrium, could form a myoma. Cohnheim championed the idea of embryonal rests as the starting point for a myoma. The relation of certain early myomas to blood vessels has impressed many workers on this problem. This relationship

suggests that the uterine myomas arise from disturbances in the growth of the embryonal blood vessels, from which the uterus and vagina originally derive their muscular tissue. Roesger, Kleinwachter, Sobotta, and others have traced the development of early myomas from blood vessels, and conclude that blood vessels control their origin and growth. According to Ewing, this idea has much to commend it, and he cites a case of his own in which there was striking evidence of the origin of the tumor masses from blood vessels. In a recent article Schwarz and Wissner have presented microscopic evidence supporting this theory, one of which is shown in Figs. 585 and 586.

Robert Meyer favors the theory that myomas are derived from muscle cells in the uterine muscle. He points out the ability of the uterine muscles to enlarge and grow during pregnancy, and he feels that if this normal process does not occur frequently, the muscle cell might be stimulated to produce myomas during the long resting period. He obtained specimens showing an uninterrupted transition from a normal muscle fiber to a myomatous fiber. Frankel believes that secondary myomas arise from daughter myoma cells in the middle layer of the capsule of the primary myoma, and stresses the importance of removing the entire capsule in order to prevent recurrence.

Histologically there are two types of myomas, namely, those composed of smooth fibers (leiomyoma), and those composed of striated muscle fibers (rhabdomyoma). The latter type is rarely found in the uterus.

Structure and Complications

Myoma may occur as a single growth or there may be many tumors in a uterus so affected. The interesting clinical features will be taken up under four headings: structure, relation to uterine wall, secondary changes, and complications and associated diseases.

1. **Structure.**—The myoma is composed of interlacing bundles of involuntary muscle fibers in a network of connective tissue (Fig. 587), the same type of tissue composing the uterine wall. At the periphery of the growth the fibers are arranged in concentric layers forming a pseudo-capsule. The adjacent muscle fibers of the uterus, which make up the outer layer of the capsule, are also arranged in the same fashion. The capsule consists of three layers, the two already mentioned and a third which lies between them and contains the vessels. It is from this central layer that the daughter myomas (Frankl) are supposed to arise.

The muscle cells themselves are somewhat longer and narrower than the ordinary uterine muscle cells. Their nuclei stain deeper than normal cells, as does also their cytoplasm. Their nuclei are usually long and the ends are rounded when seen longitudinally, while on cross section they are round or oval or crescentic. Between the muscle cells are myoglia fibrillae which extend beyond the cells and interlace with fibrillae of surrounding cells. The muscle tissue stains yellow and the connective tissue red when the van Gieson method is used. The fibrous tissue cells can be seen separating the muscle tissue into bundles by the forming septa. Numerous elastic fibers are present in the older tumors.

The blood supply to myomas was investigated by Sampson, who found that each myoma contained a mass of proliferating arteries ending in fine tufts

and that there were no veins within the tumor itself. Faulkner, using corrosion preparations, confirmed Sampson's work and concluded that these tufts formed a capillary bed which drains into the veins at the periphery of the tumor (Figs. 588 and 589).

2. **Relation to Uterine Wall.**—The myoma is nearly always encapsulated. It starts as a small nodule in the muscular layer of the uterine wall. As it enlarges there usually develops a distinct capsule, or layer of condensed tissue, which separates the tumor proper from the normal uterine wall surrounding it as previously explained. From this capsule it may be easily shelled out, except when there has been inflammatory infiltration of the capsule and tumor.
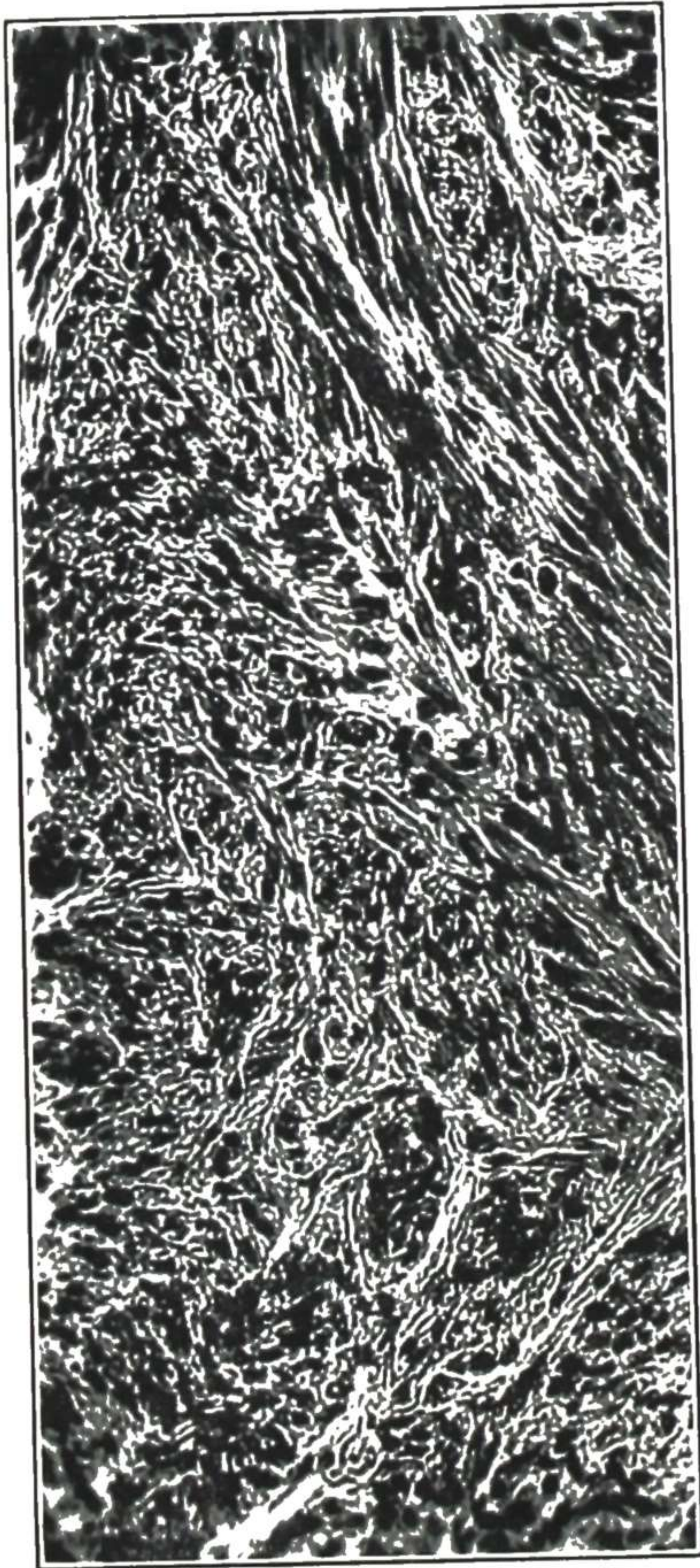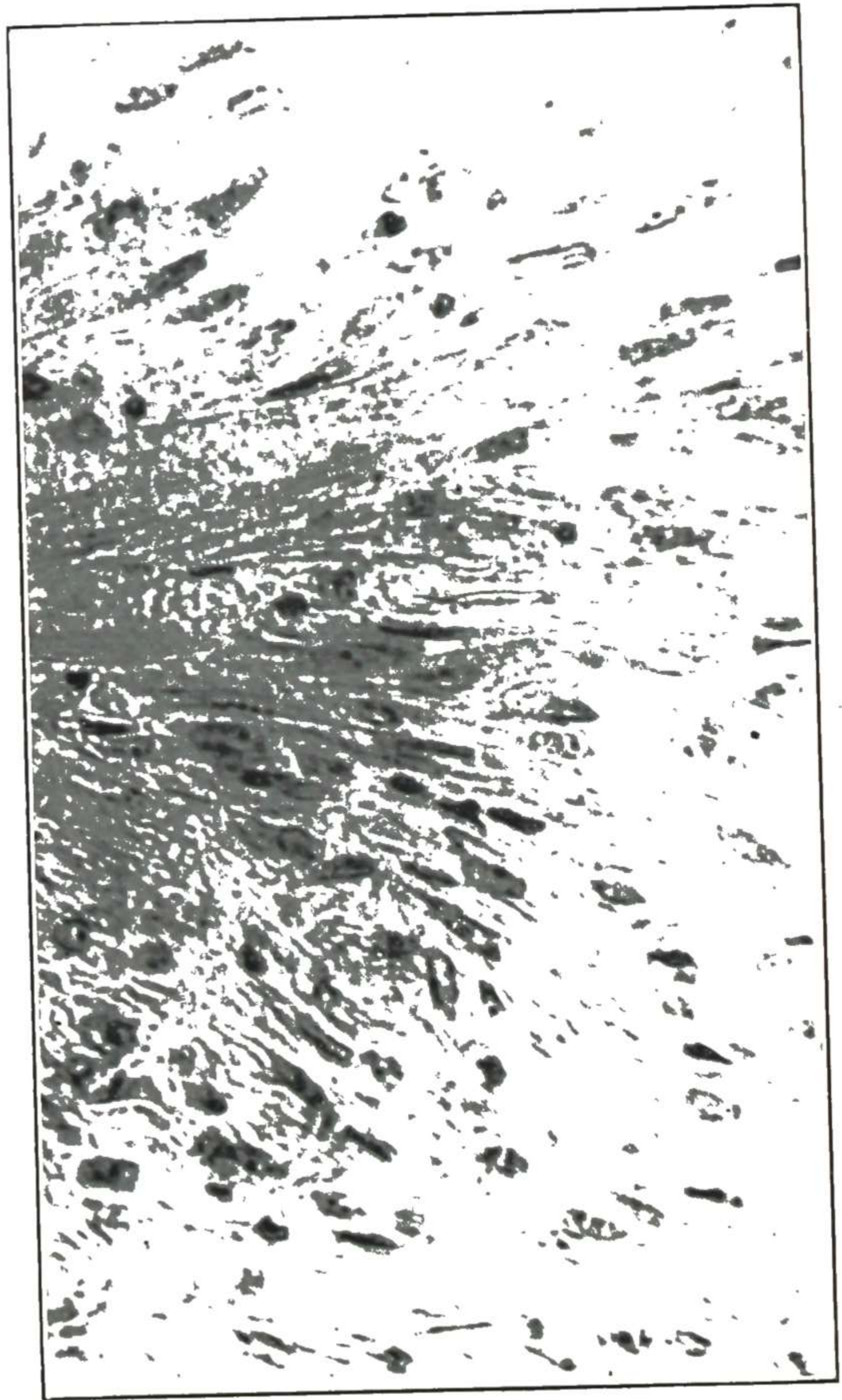
A.   B.

Fig. 587.—Microscopic structure of a myoma. *A*, Bundles of muscle fibers, extending in various directions. *B*, Higher power, showing muscle cells with rodlike nuclei. Gyn. Lab.

As long as the tumor is surrounded by the muscular tissue of the wall, it is known as an **interstitial** or **intramural myoma.** They comprise from 60 to 70 per cent of the cases.

As the ordinary encapsulated tumor grows, it pushes in the direction of least resistance, stretching the muscular tissue around it and tending to push

Fig. 588.—Myomas in uterus removed during menstruation. Largest myoma 8 cm. in diameter. Black venous mass in uterine cavity. Occasional veins injected in larger tumor with mass of proliferated arteries smaller than normal. Tumor to left is compound myoma with veins between nodules, two of which show small areas of degeneration. (From Faulkner: Am. J. Obst. & Gynec., February, 1944.)

Fig. 589.—Outside half of specimen in Fig. 588. Shows the veins to the large tumor. Uterine cavity split open at left. (From Faulkner: Am. J. Obst. & Gynec., February, 1944.)

the muscular tissue aside. When it pushes aside the wall tissues and progresses toward the uterine cavity it may come in time to lie beneath the endometrium, where it is known as a **submucous myoma** (Fig. 590). Submucous myomas comprise about 10 to 15 per cent of the cases. The proximity of the growth to the endometrium causes, in the latter, changes due to pressure. The glandular portion is narrowed, the surface epithelium flattened and missing entirely in some areas.

The submucous myoma may project farther and farther into the uterine cavity, until it is attached to the wall only by a pedicle, constituting a **pediculated submucous myoma.** A pediculated submucous myoma may be forced into the cervical canal and later out into the vagina (Fig. 590). It may in this way cause partial inversion of the uterus, a fact that must be kept in mind when removing such a growth by vaginal excision (Fig. 591). Occasionally the tumor will be forced outside the vagina.
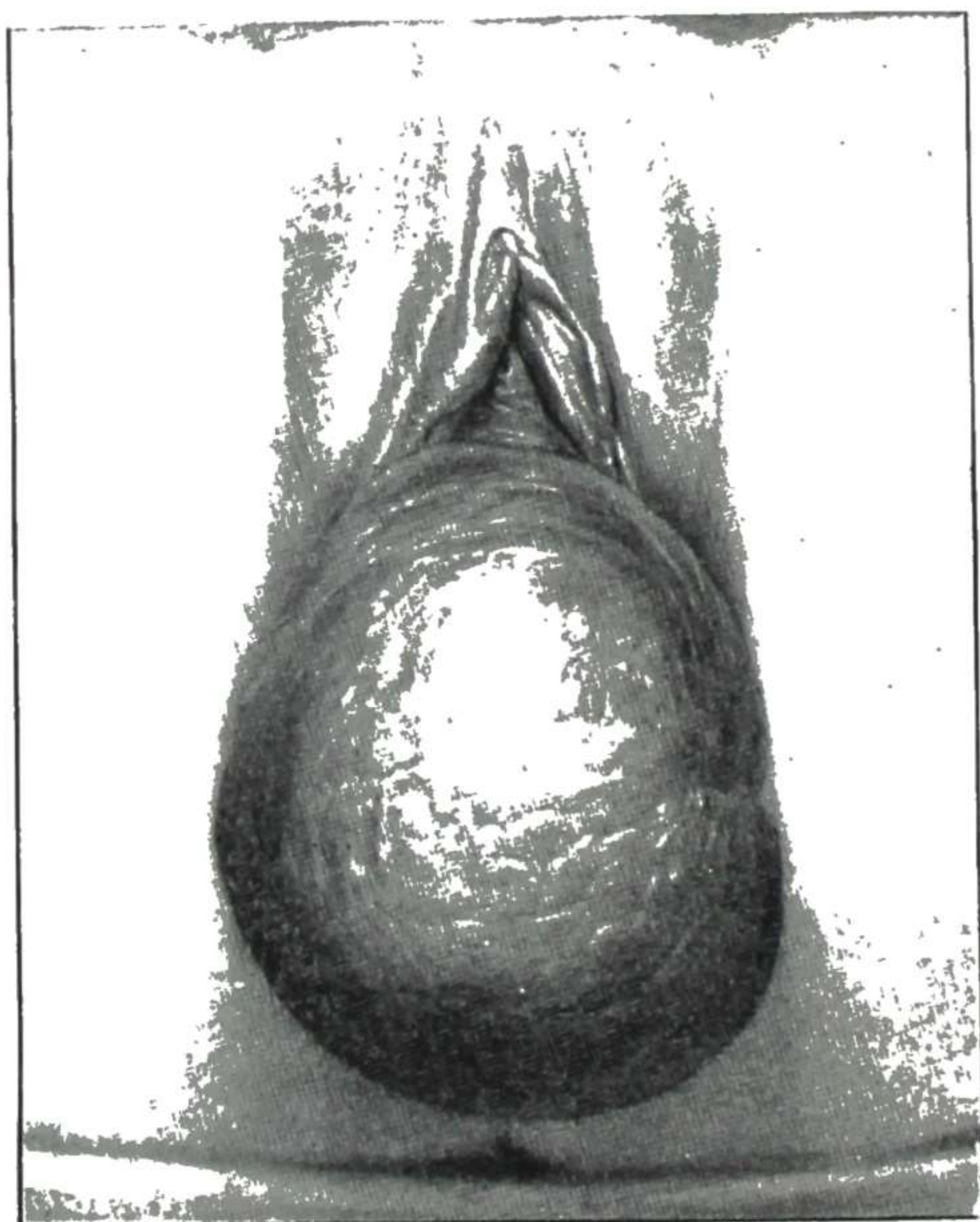

Fig. 590.

Fig. 591.

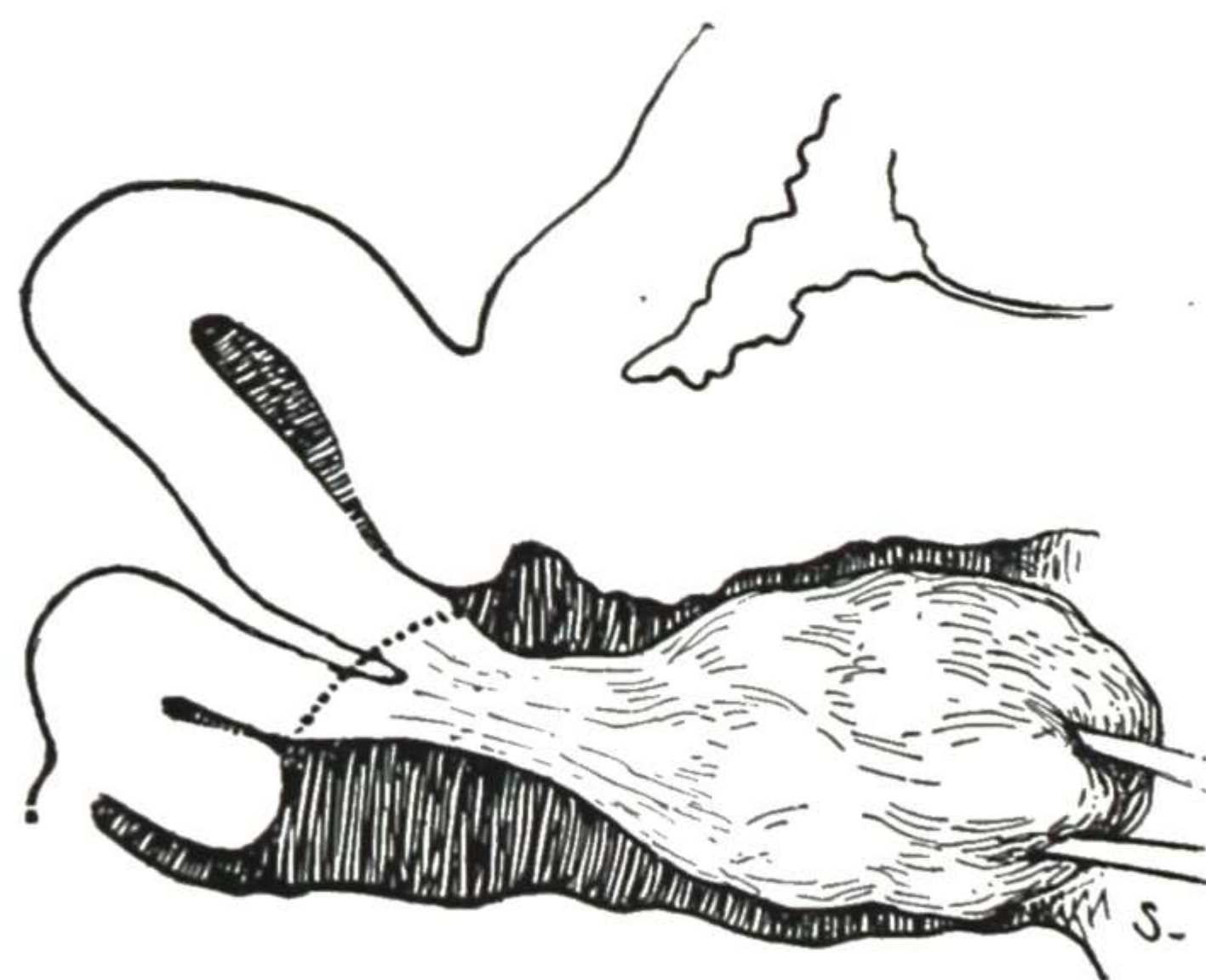Fig. 590.—A large pediculated myoma of the uterus, projecting outside the vagina (From Kelly: Operative Gynecology.)

Fig. 591.—Showing one of the dangers of myomectomy in such a case. If the tumor is pulled down strongly and the clamp placed as high as possible, the line of division may open the peritoneal cavity.

On the other hand, if the myoma pushes outward as it develops it may come to lie just beneath the peritoneum, where it is known as a subserous or **subperitoneal myoma.** Several of these are shown in Fig. 593. They comprise from 20 to 30 per cent of the cases. This process of escape from the grasp of the muscular tissue may progress, the tumor projecting farther and farther beyond the outline of the uterus but still covered by the peritoneum, until it is attached to the uterus only by a comparatively narrow band of tissue, or pedicle, carrying the blood vessels and covered by peritoneum. It is then a **pediculated subperitoneal myoma.**
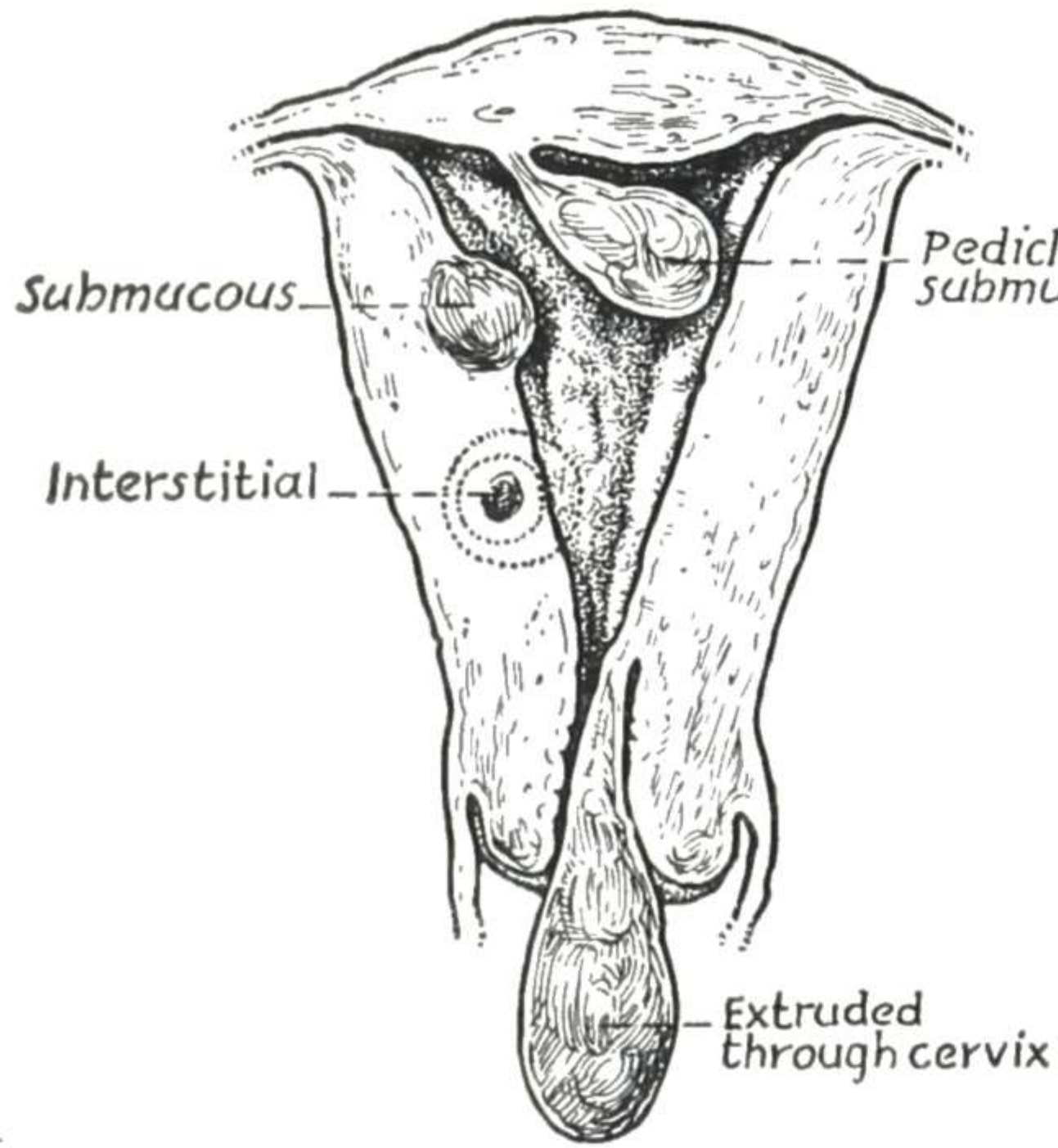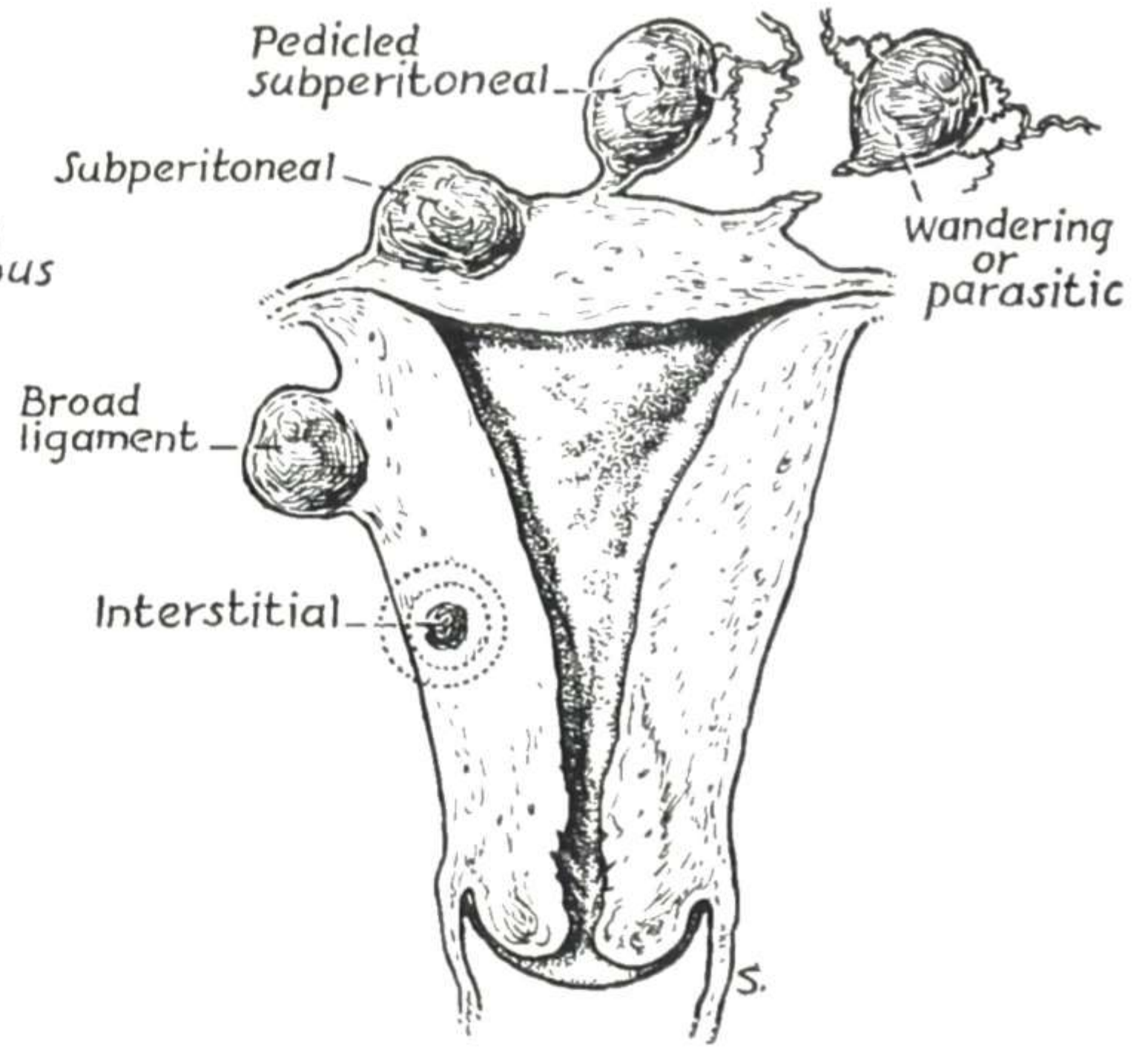
Fig. 592.

Fig. 593.

Fig. 592.—The development of different types of submucous myoma.
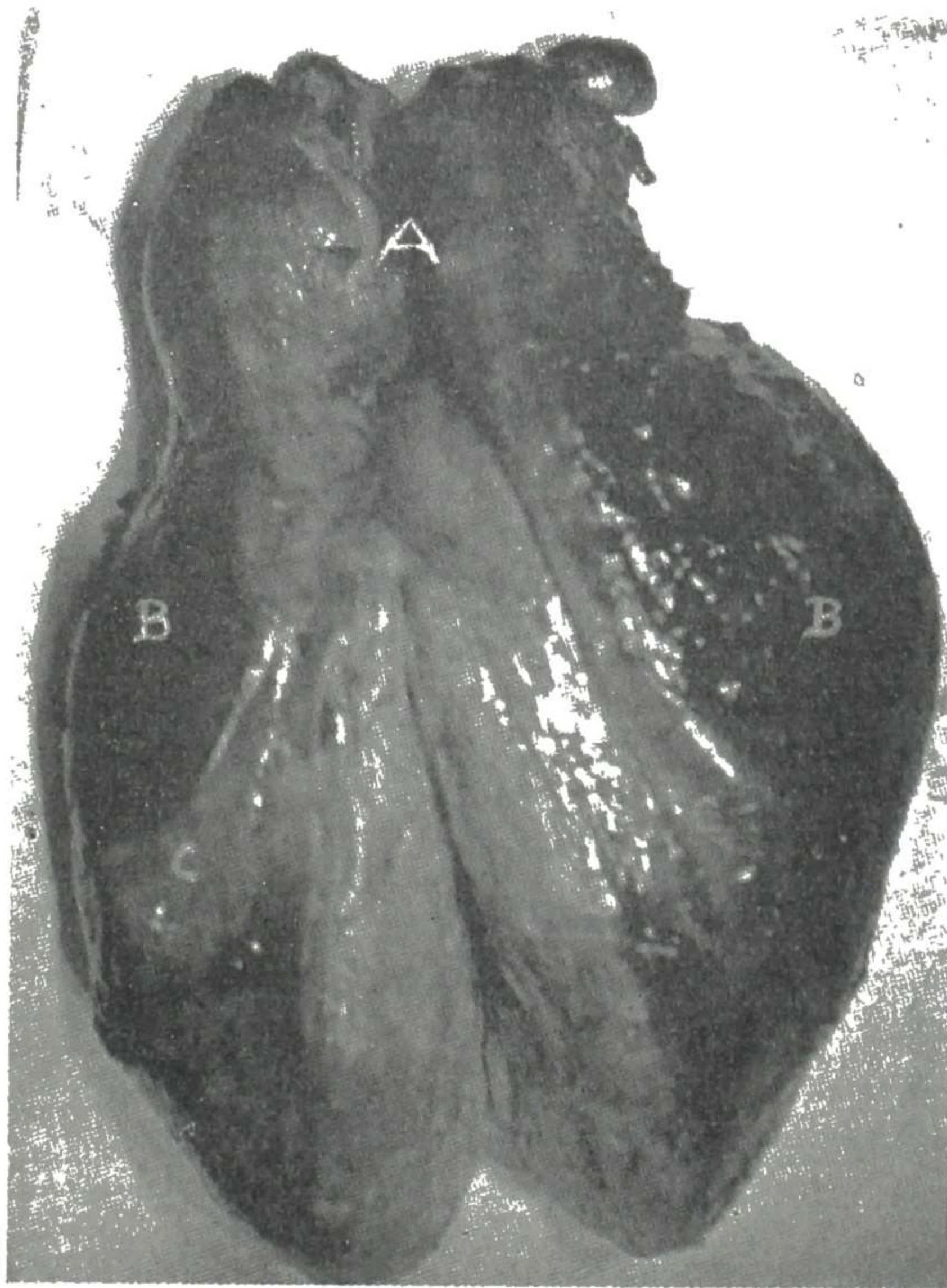Fig. 593.—The development of different types of subperitoneal myoma.

Fig. 594.—Photograph showing large cervical fibroid and small uterus on top. *A*, Body of uterus; *B*, fibroid of cervix; *C*, vaginal wall. (From Greenhill: Am. J. Obst. & Gynec., April, 1936.)

In some cases adhesions to adjacent structures are formed, and through these adhesions the tumor may receive part of its blood supply. Occasionally the pedicle of such a tumor is severed by torsion or otherwise, and the tumor is thus entirely separated from the uterus and receives its blood supply through the vascular adhesions. Such a tumor is known as a detached or "parasitic" or **wandering myoma,** and constitutes one of the curiosities of pathology. Many curious and instructive examples of parasitic myoma, as well as of all other types, are described and beautifully illustrated in that remarkable monograph by Cullen and Kelly, *Myomata of the Uterus.* Rickles reported a huge parasitic fibroid with sarcomatous degeneration five years after a hysterectomy.

If a tumor which is escaping outward from the grasp of the muscular wall is so situated that it projects into the broad ligament, it is known as an **intraligamentary myoma.** If it projects in such a situation that it raises the peritoneum behind the uterus and passes back of the peritoneum, it is then called a **retroperitoneal myoma.**

The early stage of the myoma as an intramural or interstitial nodule, its gradual push toward the uterine cavity or toward the peritoneal surface as it grows, and the various relations to the uterine wall which it may occupy are summarized in Figs. 592 and 593.

Most myomas are found in the body of the uterus, as indicated in the various illustrations. In a certain proportion of cases the myoma is situated in the cervix. Bland-Sutton found in a series of 500 cases that 5 per cent were **cervix myomas.** These are more often single, and rarely project into the cavity, as the cervical cavity is small. They are usually comparatively small, but sometimes reach a size of eight pounds. Fig. 594 shows one reported by Greenhill.

3. Secondary Changes.—We have already given the primary structure of the different forms of myoma. In many cases there are found secondary changes in the tumor structure. Various types of degeneration occur. In fact, it is unusual to find a large myoma without degeneration of some kind. Frankl believes that the cause for the frequent occurrence of degeneration in these growths is to be found in the course of the nutritive artery entering the myoma. He states that as the myoma grows it rotates in its capsule. This causes the artery, which formerly entered in a straight line, to be bent at a right angle at two places—first, at the inner surface of the capsule, and second, where it enters the tumor proper. With these two likely points of compression it is not surprising that the nutrition to the growth is frequently impaired and that the degeneration usually starts at the center of the tumor.

The secondary changes found on detailed examination of removed myomas include edema from circulatory disturbance, hyaline degeneration, red degeneration (a circulatory disturbance principally associated with pregnancy), myxomatous (mucoid) degeneration, cystic formation, suppurative necrosis, calcification, sarcomatous degeneration, and other rarer changes (atrophy, fatty change, amyloid change).

The frequency of secondary changes in myoma is indicated by an analysis of 1,815 reported cases, consisting of nine series of consecutive cases in which

degenerations were noted. In this combined series secondary changes of some kind were found in about 20 per cent of the cases. Malignant disease, as sarcomatous degeneration or associated carcinoma, was encountered in 3.6 per cent, suppuration in 5 per cent, necrosis from other causes in 4.7 per cent, cystic change in 3 per cent, and some calcification in about 2 per cent.

A frequent type of secondary change is *hyaline degeneration*. This process may go on to liquefaction, and hence is one of the etiological factors in the formation of cystic areas in myomas. Such a liquefied and cystic spot, if large enough to be felt on examination as a soft area, may throw doubt on the diagnosis of myoma. If the soft area be small, the surrounding solid portion of the myoma makes the diagnosis clear, but if the cystic part be large, as occasionally happens, it may lead to a mistaken diagnosis of ovarian cyst.
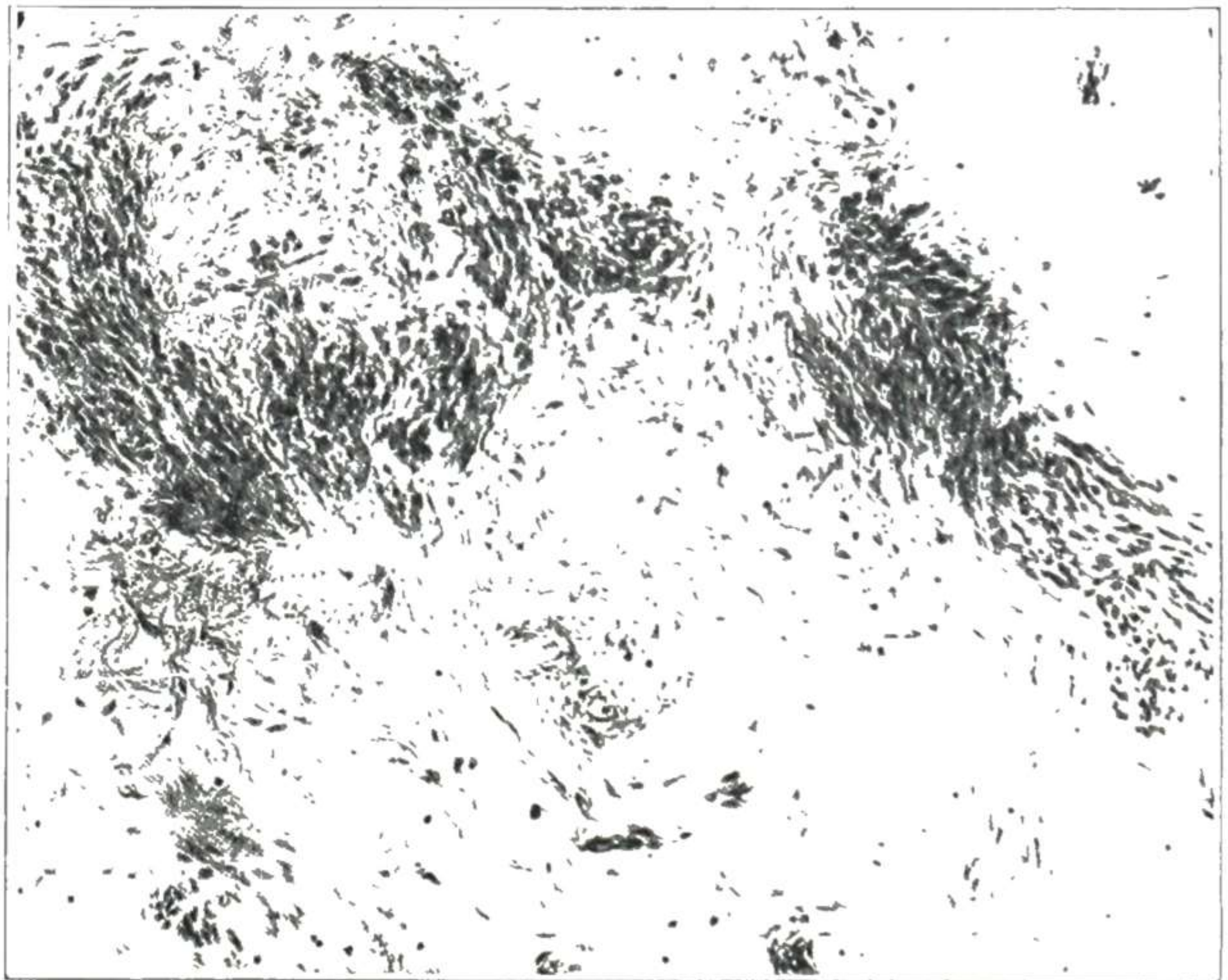

Fig. 595. Fig. 596.

Figs. 595 and 596.—Hyaline degeneration in a myoma. Fig. 595, Low power. Fig. 596, High power. Gyn. Lab.

In the early stage of this necrobiotic process, before the conversion into homogeneous translucent material, the affected area has a white appearance. This feature is shown microscopically in Figs. 595 and 596. Ordinarily an area progresses to definite hyaline material and on to liquefaction while new white areas are forming. Occasionally the early stage of the process affects a very large area at once, a beautiful specimen of which is shown in Fig. 597.

Another interesting secondary change is *red degeneration*. Though this is usually associated with pregnancy, circulatory disturbance about the tumor may cause it in the nonpregnant, as in the specimens shown in Figs. 598 and 599. The red color is due to marked hemolysis occurring in the tumor. Microscopically numerous fragments of blood cells are seen and, as to tissue cells, the central portion of the degenerated area shows cell outlines with no nuclei

(the so-called "ghost cells"), while toward the periphery the usual muscle cells appear. Myomas with *cystic formation* from noninfective necrobiosis are shown in Fig. 600.

In *infective necrosis*, the infection may reach the myoma from within the genital canal or from adjacent structure or by way of the blood stream. The ensuing inflammation causes swelling of the growth within its capsule, which in turn interferes with its circulation and leads to necrosis, which may involve a part of the tumor or all of it. A striking example of massive necrosis, the

Fig. 597.—A subperitoneal myoma showing an unusually large area of the white stage of necrobiotic degeneration. Drawing made from the fresh specimen shortly after operation by Dr. H. S. Crossen. The color reproduction is accurate. The strange whiteness was very striking in contrast with the normally vascularized portion. The necrobiotic part was firm throughout and presented a fairly uniform appearance—no cavities nor malignant areas. Gyn. Lab.

result of a midwife's abortion attempt, is shown in Fig. 601. Submucous pediculated myomas are particularly liable to infective necrosis. In some cases this effects a cure, the suppurating disintegrating tumor being expelled, with subsequent gradual cessation of symptoms. In other cases the suppuration of the growth may lead to a serious condition with resulting general sepsis. In Fig. 602 is shown the collapsed shell of a very large submucous myoma which suppurated and became necrotic.
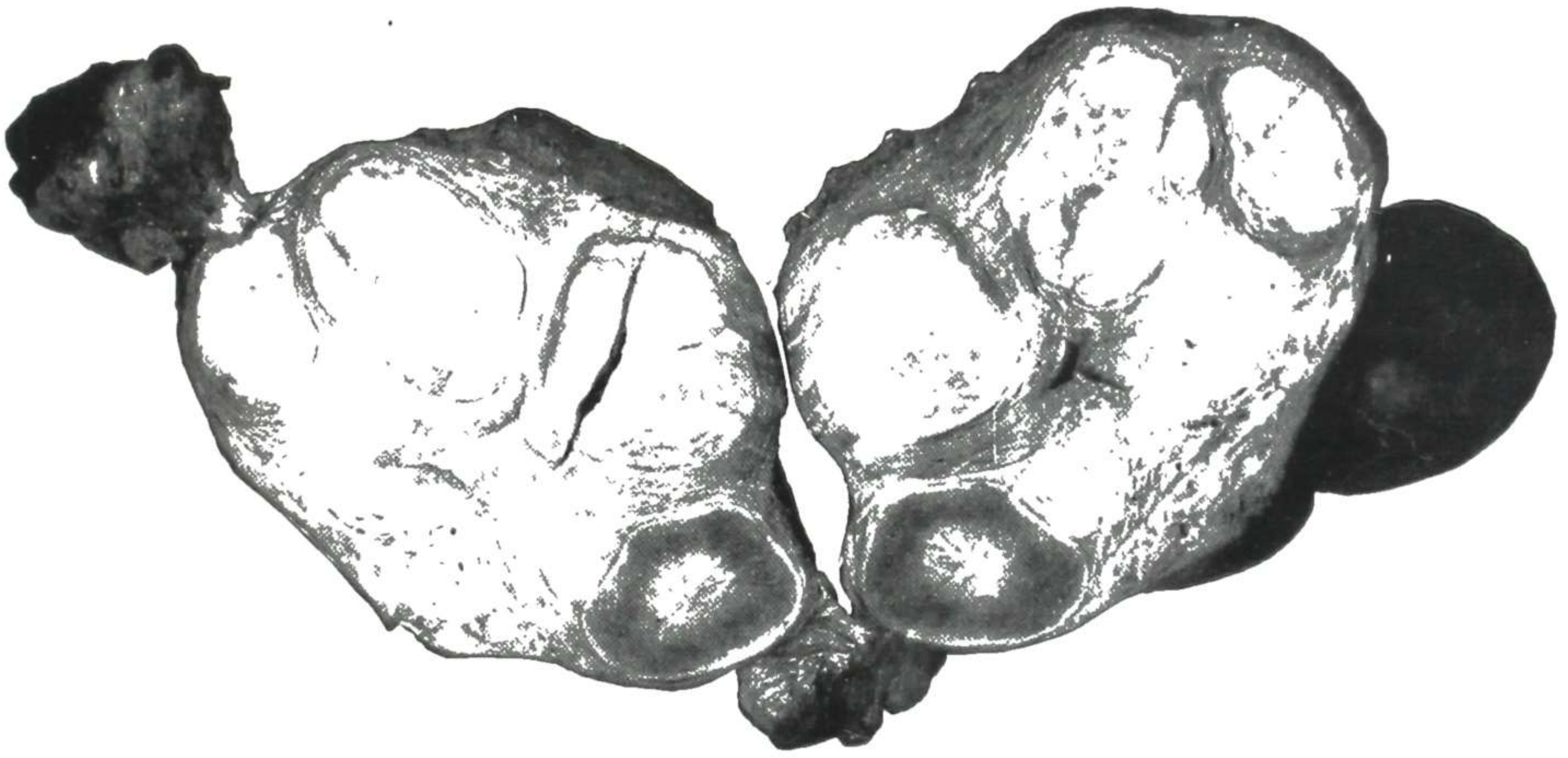
Fig. 598.—Red degeneration in a myoma nodule (lower one) so marked that it shows well in this ordinary photograph of the specimen. Gyn. Lab.

Fig. 599.—Red degeneration of a myoma. Drawing made from the fresh specimen shortly after removal by the authors. The tumor caused symmetrical enlargement of the uterus and was so soft that it gave perfect fluctuation. Examined after the abdomen was opened, the organ felt exactly like a pregnant uterus. However, the color of the peritoneal surface of the uterus had not the usual bluish tinge of pregnancy, and the record of persistent bleeding ruled out a normal pregnancy. Incision of the uterus revealed the condition shown above. The large, dark red mass was soft and edematous and much too large for the confining capsule of muscle wall. Notice how it bulges and rolls out over the sides. Gyn. Lab.

Sarcomatous change may take place in the interior of a myoma, which fact must be considered in deciding on and in executing the operative work. On account of this possibility all tumors removed, particularly the larger ones, should be opened for inspection as to gross structure (to decide whether or not cervical stump and adnexa also should be removed) and later submitted to microscopic investigation, so that if any sarcomatous change is present appropriate additional treatment may be carried out promptly.
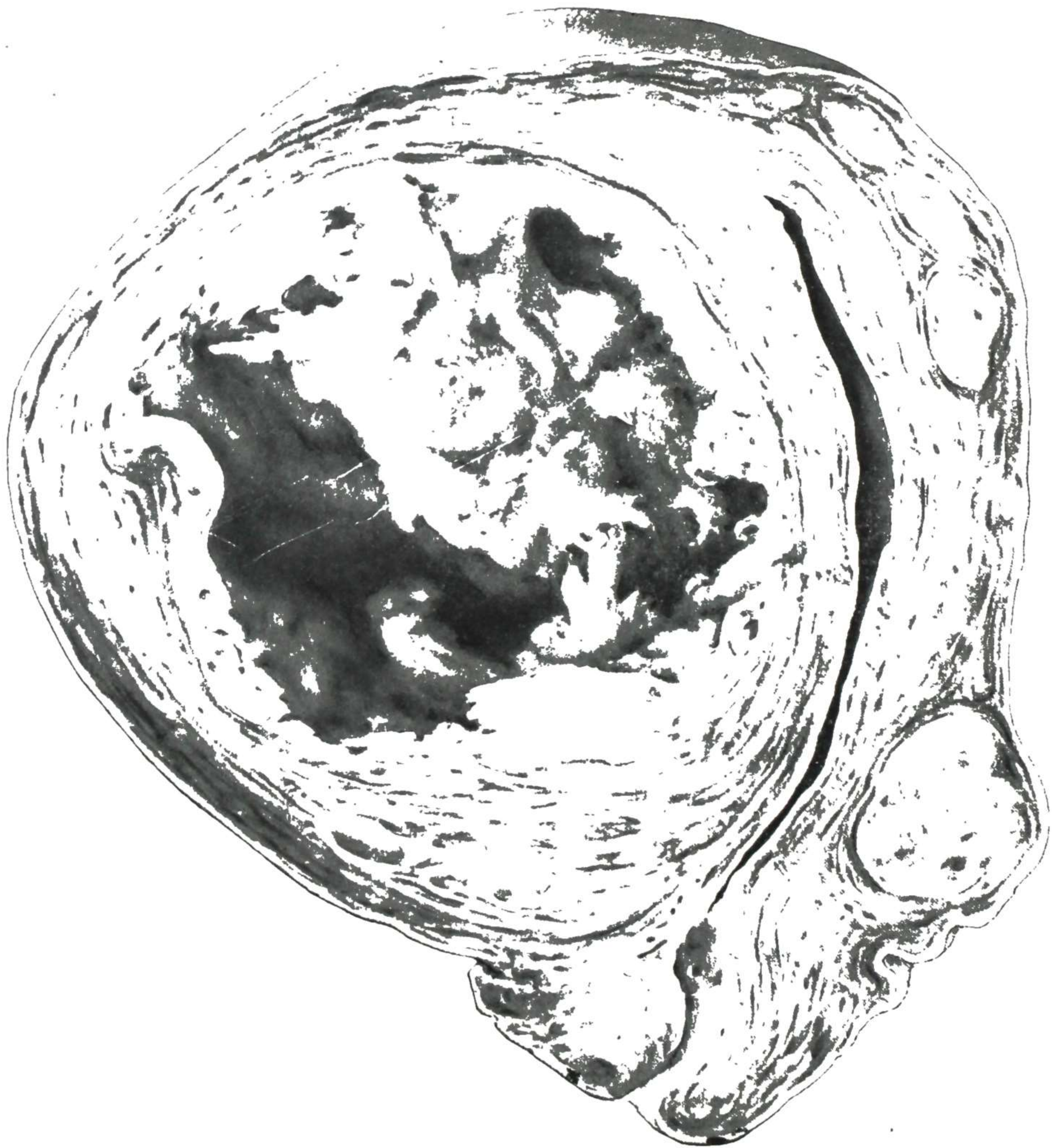

Fig. 600.—Cystic cavity forming in the largest of the numerous intramural nodules of a myomatous uterus.

Calcification is not uncommon, and ossification may occur. They are easily recognized as stony or bony hard areas on cutting through the tumor. Fatty degeneration may occur, giving some areas of the cut surface of the myoma a yellow color and soft consistency.

4. **Complications and Associated Diseases.**—These are very numerous and very important, for a large proportion of the suffering and fatality in myoma

cases comes from them. Some of these conditions are due directly to the myoma, some are due indirectly to it, and some have no etiologic connection with the myoma, but are only associated affections. Some of them cannot be assigned exclusively to one group or the other; therefore, all of them will be considered together. For convenience they are divided into three classes ac-
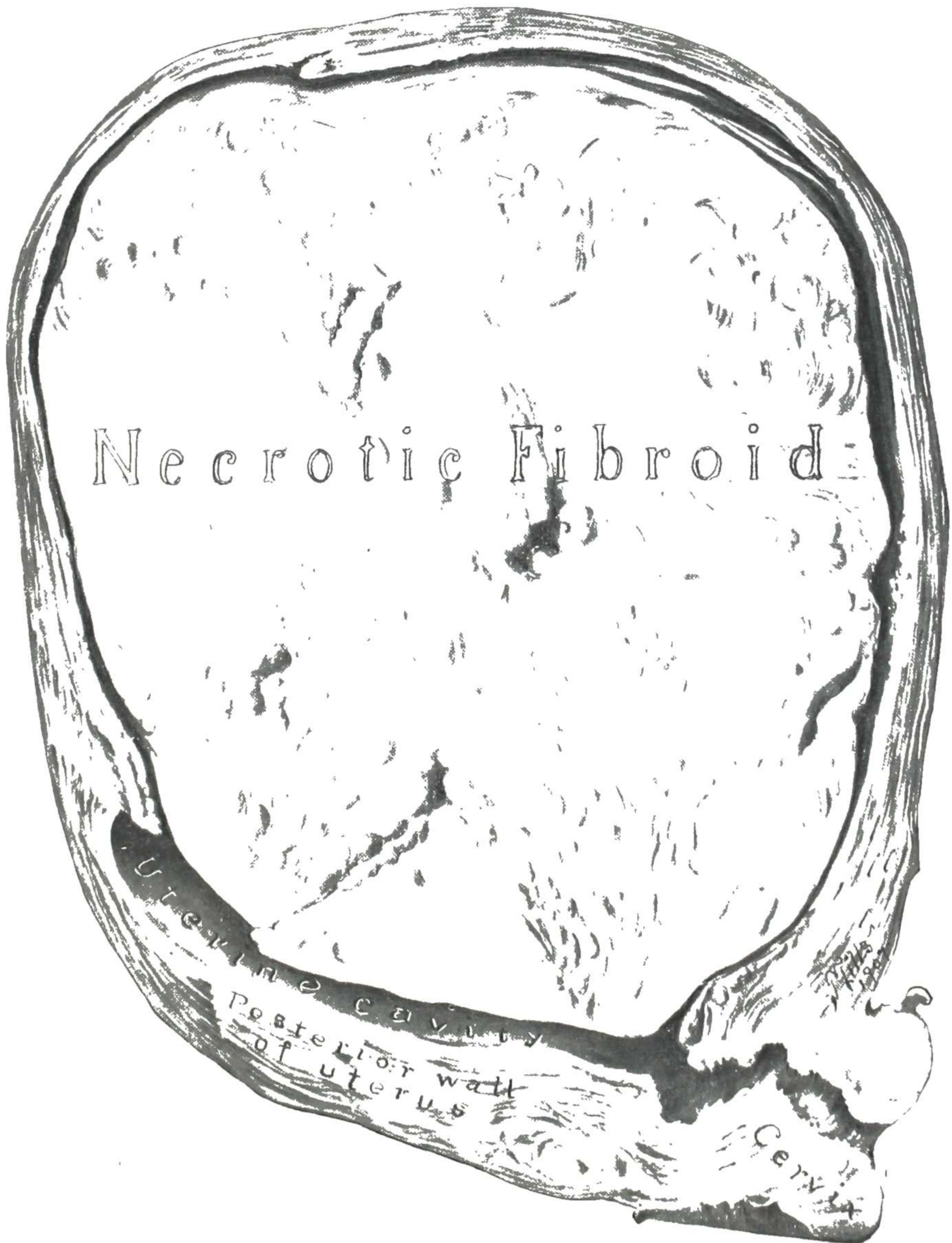

Fig. 601.—Section of a necrotic myoma. Dr. H. S. Crossen saw the patient in consultation with Dr. C. O. C. Max. There was a large myoma extending nearly to the umbilicus, which had become necrotic from infection due to the introduction of a uterine sound by a midwife for abortion of a supposed pregnancy. The patient was in a desperate condition. At the operation it was found that the necrotic myoma had perforated the uterine wall and was in contact with the omentum. This anteroposterior section of the removed uterus and tumor shows accurately the relation of the necrotic mass to the uterine wall. It was almost free in its suppurating bed. The perforation into the peritoneal cavity was at another part of the mass. Gyn. Lab.

cording to locality: (a) in the uterus, (b) in adjacent structures, and (c) in distant organs.

a. In the uterus is found thickening of the endometrium, distortion of the uterine cavity, with atrophy of the endometrium at pressure points, and dis-

Fig. 602.—A large, pediculated submucous myoma which suppurated and the greater part of which became necrotic, only the shell remaining. This collapsed shell is seen lying in the vagina. Gyn. Lab.

placements of the uterus from tumor growths. There may be marked distortion of the whole uterus. Carcinoma is an important associated disease that must be kept in mind and searched for. It may be present in the cervix (Fig. 603) or in the corpus uteri (Fig. 604). Pregnancy also is a rather fre-

quent complication of myoma, either as an early pregnancy with a large tumor or as a more advanced pregnancy associated with a small tumor (Fig. 605).

In pediculated myomas the pedicle may become twisted, shutting off the blood supply. In a recent case (Fig. 606) reported by Kaye and Ficarra, a vessel had ruptured and there was considerable intra-abdominal hemorrhage. A case of spontaneous rupture of a large vein in a fibroid uterus was reported by Schneider and Jemerin.

Fig. 603.—A small epithelioma of the cervix associated with myoma of the corpus uteri. In this case the most evident lesion was the myoma, but further examination revealed induration and irregularity about the external os, with some bleeding on examination. A piece of tissue excised from the suspicious area and submitted to microscopic examination showed epithelioma.

b. Under changes in adjacent structures come salpingitis, hydrosalpinx, and pyosalpinx, and, also, compression and inflammation of the ovaries. There may be troublesome pressure on the bladder or ureters or pelvic vessels or rectum.

Adhesions to various important organs in the pelvis and lower abdomen constitute an important form of complication frequently found in myoma cases.

c. The changes in the heart and vascular system associated with myomas are not clear. Some feel that there is a definite toxic substance produced in the myoma, or at least associated with its presence, which affects the circu-

latory system. Undoubtedly the marked anemia present in some cases due to excessive blood loss at the menses contributes to the cardiac symptoms and signs. Statistics on cardiac disturbances associated with myoma collected from the literature, totaling 951 cases, varied from 25 per cent to 47 per cent, with an average of 38 per cent. In a controlled series Jacobs concludes that there was no difference in the cardiac clinical and laboratory findings between the fibroid cases and the control series of patients in the same age group.
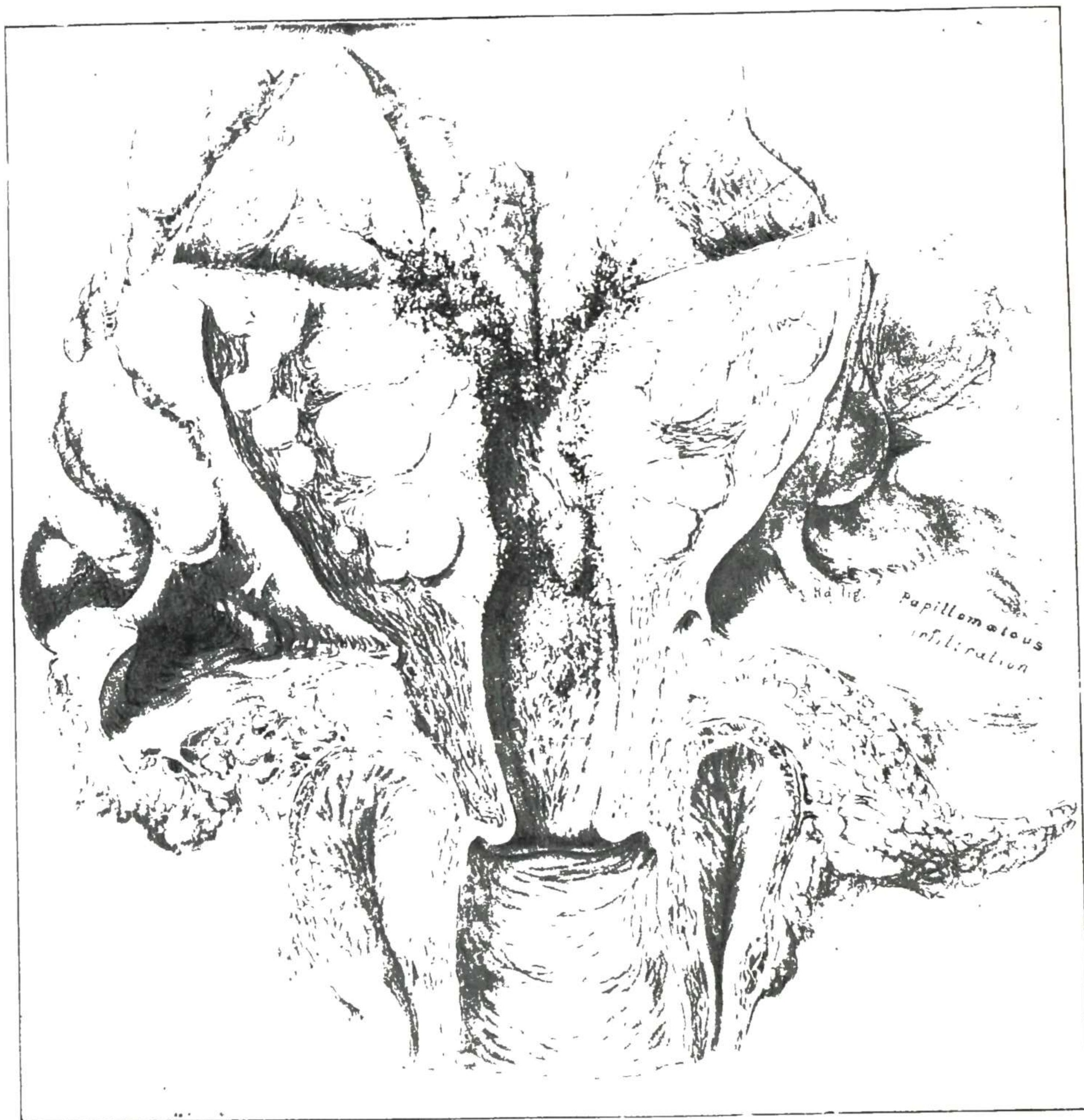

Fig. 604.—Large mass in pelvis formed by uterine myomas and carcinoma. (From Cullen: Cancer of the Uterus.)

Dietel found that the electrocardiograms showed an increased incidence of deviation from normal in the myoma cases and the deviations resembled those commonly found in cases with thyrotoxicosis. He found an increased basal metabolic rate in many of his myoma cases, and hence concluded that thyroid activity may be abnormal in myoma cases. Moehlig found goiter to be present in 63 per cent of 410 Caucasian women who had fibromyomas, but none of

these were of the exophthalmic type. The high incidence of goiter with myomas had previously been noted by numerous workers.

Hypertension with systolic readings from 140 to 270 were found in 29 per cent of Moehlig's cases and the average age in these patients was 45 years.
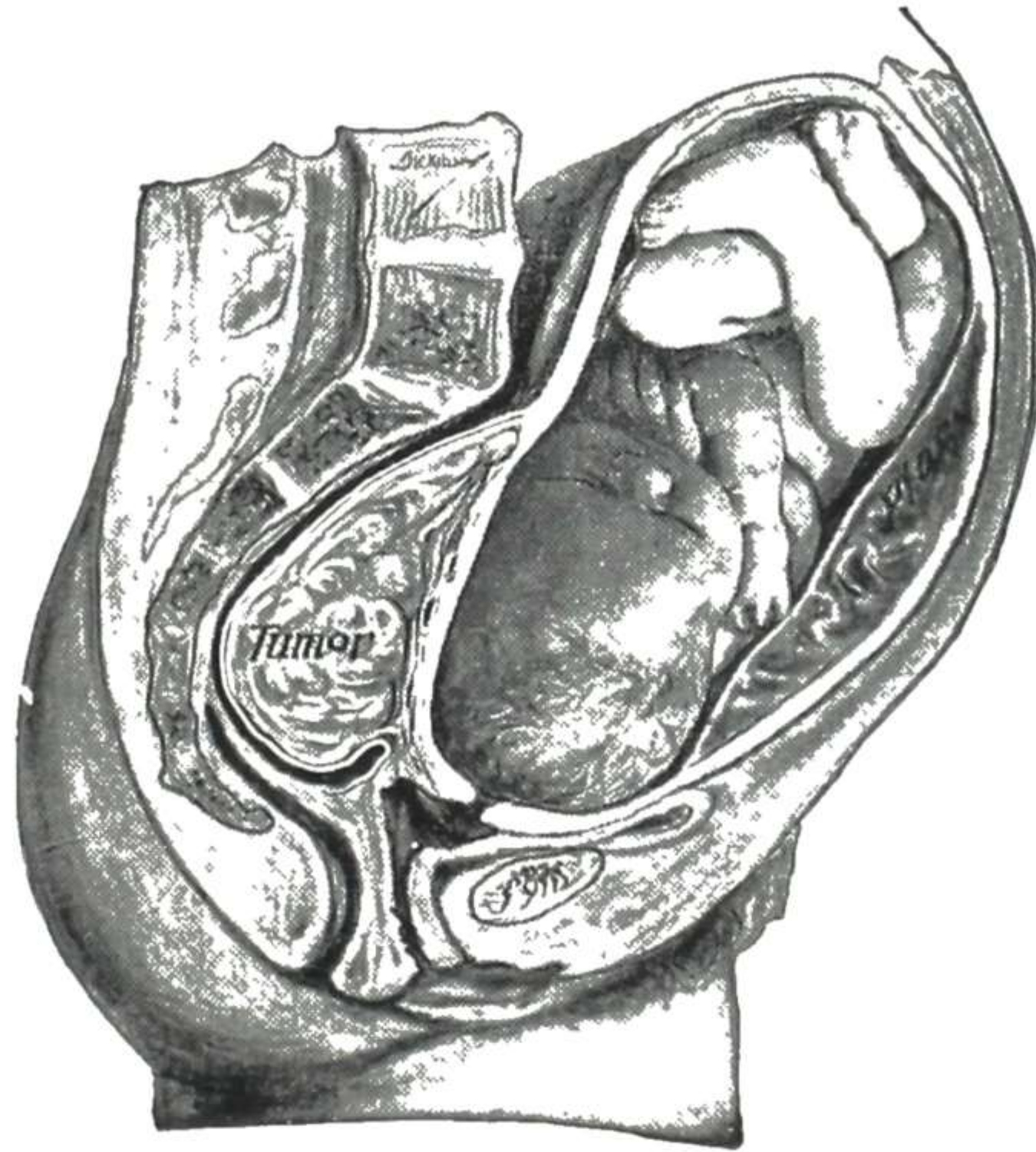

Fig. 605.—Myoma and pregnancy, the pregnancy forming the larger part of the mass. (From Norris, after Simpson: American Textbook of Obstetrics.)
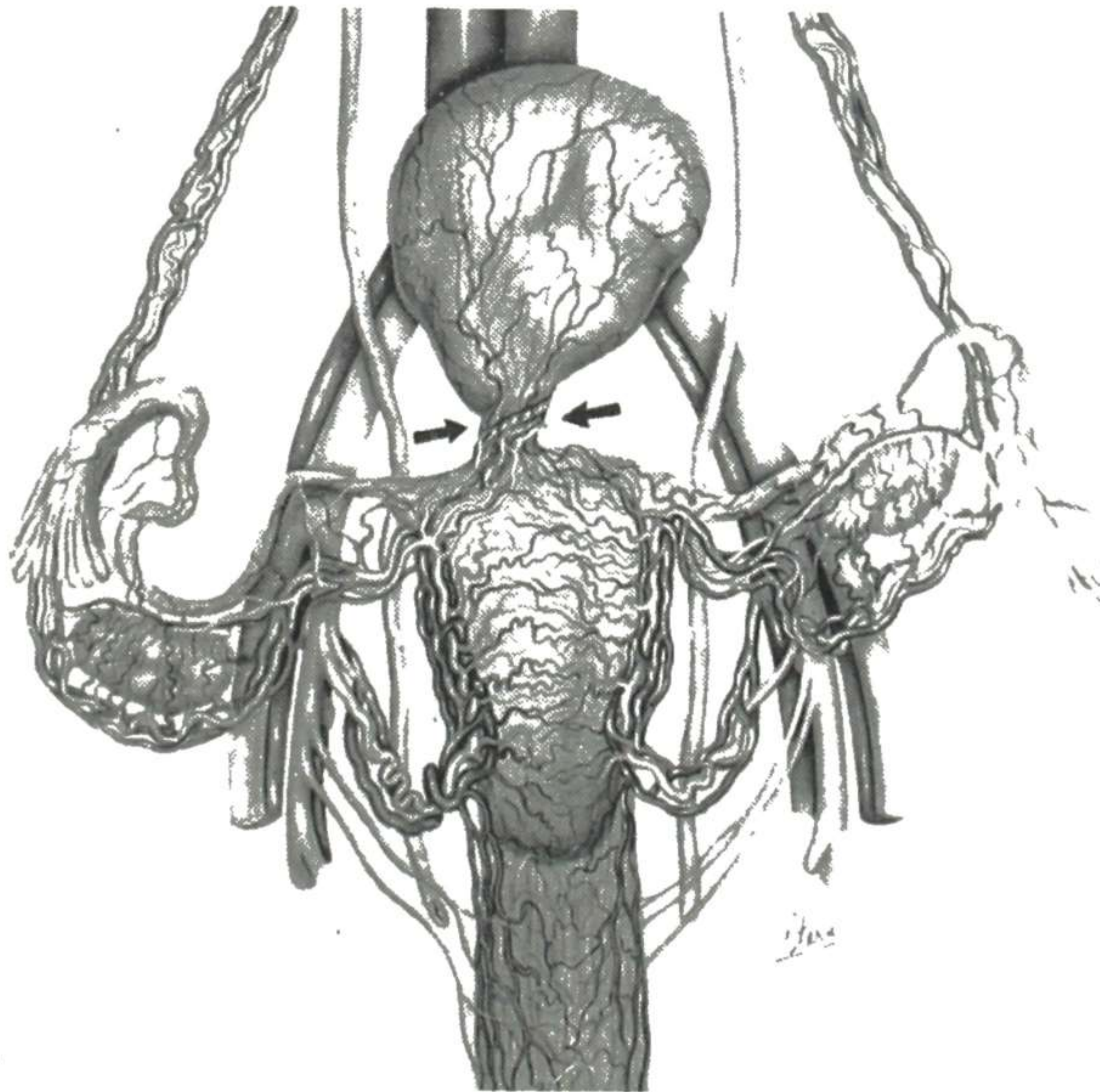

Fig. 606.—Drawing of the twisted uterine tumor. (From Kaye and Ficarra: J. A. M. A., Oct. 21, 1950.)

Johnson, in a series of 104 cases of uterine fibroids associated with hypertension, studied two to eight years after hysterectomy, found that the removal of the tumor had no material effect upon the blood pressure. He feels that the mortality in these cases, if properly handled, should be no greater than that

in other cases of major pelvic operative work in the same age group. Neto, Hamermesz, and Salum at the University of São Paulo found no difference between the blood pressures in the myoma group and in the control group in the white women, but in the Negro group the myomatous patients had a significantly higher average systolic pressure than the Negro control group and also the average systolic pressure in the Negro myomatous patient was considerably higher than in the white myomatous patient. Another interesting finding in this series was the fact that the relative frequency of systolic readings above 140 mm. mercury varied with the size of the tumor; the larger tumors (over the size of a fetal head) had the highest incidence (33.4 per cent) of elevated pressure.

Baldy, from the records of the Gynecian Hospital, in a series of 3,413 operations found that sudden death occurred 36 times as frequently in fibroid cases as it did in the general run of operative cases. In more recent series the mortality in myoma cases is no greater than it is in ordinary hysterectomy. These differences in the statistics can be explained in several ways; in the first place, improvements in diagnosis, pre- and postoperative care, and in operative technique have all contributed to a better mortality rate. Second, in the early days the tumors were usually considerably larger when the patient came in for operation, and this added to the technical difficulty of the operation. In these neglected cases the patient was probably suffering from chronic anemia, and with these large tumors the incidence of hypertension and cardiovascular disease was higher than it would have been in smaller tumors.

Symptoms and Diagnosis

The **symptoms** given by the patient are, in the usual order of their appearance, (1) menorrhagia, (2) leukorrhea, (3) pressure symptoms, (4) pain and, (5) a lump in the lower abdomen.

1. *Menorrhagia.*—This is usually the first disturbance noticed, particularly in submucous and interstitial growths. There is much variation in the menstrual disturbance. Usually the flow is increased, but sometimes it is diminished.

2. *Leukorrhea* is usually present after a time, especially in the submucous and interstitial growths.

3. *Pressure Symptoms.*—These are indefinite, simply an indication that there is some slight disturbing element in the pelvis. The patient has some bladder irritability and a feeling of weight in the pelvis. There is usually constipation. After the tumor becomes large, marked pressure symptoms occur.

4. *Pain* appears later. It is usually present as a backache (lumbar or sacral) or as pain in the lower abdomen or a thigh pain on one or both sides. The pains usually come and go at first and are worse when the patient is on her feet and also at the menstrual periods.

5. *Lump.*—In a large proportion of the cases, after some months or years a lump is noticed in the lower abdomen. If the mass is smooth, however, it is surprising how large it will sometimes get before the patient notices it. Of course a mass with nodular projections is usually noticed as soon as it begins to distend the lower abdomen. In a certain proportion of cases, the

mass, even when large, is still too deeply placed in the pelvis to be appreciable to the patient, and in some cases (small submucous myoma) the mass is not appreciable to the physician, even on careful bimanual examination, though there may be much bleeding and distress.

The **diagnosis** of uterine myoma must rest on the examination findings, for the symptoms are not distinctive. Taking up the points as given in the chapter on Examination, we find as follows in the case of a fibromyoma:

1. *Position of Mass.*—In the central part of the pelvis and extending from there toward one side.

2. *Size of Mass.*—May be any size, from one barely palpable in the wall of the uterus to a large tumor filling the abdomen.

3. *Shape.*—Individual tumors are apparently spherical, but as they project from the uterus or grow beside each other, they form a mass of very irregular contour, usually presenting several distinct bosses or rounded projections outside the general outline of the mass.

4. *Consistency.*—Firm, usually much harder than the adjacent uterine wall. Occasionally part of a tumor will undergo cystic change—but even then the greater part of the mass is usually solid.

5. *Tenderness.*—Not tender, unless incarcerated in pelvis or pressing on nerves or accompanied with inflammation.

6. *Mobility.*—The tumor and uterus are movable together up and down in the pelvis, but they are not movable separately unless the fibroid is pediculated.

7. *Attachment.*—Attached in the uterine region and free elsewhere, unless complicated. But there may be conditions which fix the whole mass, due to the tumor itself or to inflammatory or other complications. A subperitoneal myoma with a long pedicle may be mistaken for a growth from some of the abdominal organs. The pedicle connecting the mass with the uterus can usually be felt on deep bimanual palpation. In a difficult case, a useful expedient is to have an assistant grasp the tumor and draw it up into the abdomen while the examiner makes deep bimanual palpation in search of the pedicle, which is thus made tense and is more easily felt. Occasionally a myoma becomes detached from the uterus or has such a long pedicle that it appears free, but that is rare.

When making the diagnosis of myoma of the uterus, the following conditions and questions must be considered.

A. PREGNANCY must always be considered in any enlargement of the uterus, and the normal and abnormal conditions of pregnancy must be kept in mind. An enlarged retrodisplaced pregnant uterus which is still fairly firm because the pregnancy is early (Figs. 607 and 608) may be mistaken for a myoma. This particular condition is responsible for most of those embarrassing situations in which, with the abdomen open, the surgeon finds that his "fibroid" is a pregnancy.

Farther along in pregnancy, the marked irregularity of the enlarging uterus occasionally found, as shown in Fig. 609, may lead to a mistaken diagnosis of large myoma with cystic change. On the other hand, a large myoma occasionally simulates the shape of the pregnant uterus, as in Fig. 610, and if there is cystic change there may be simulation also of the cystic and solid
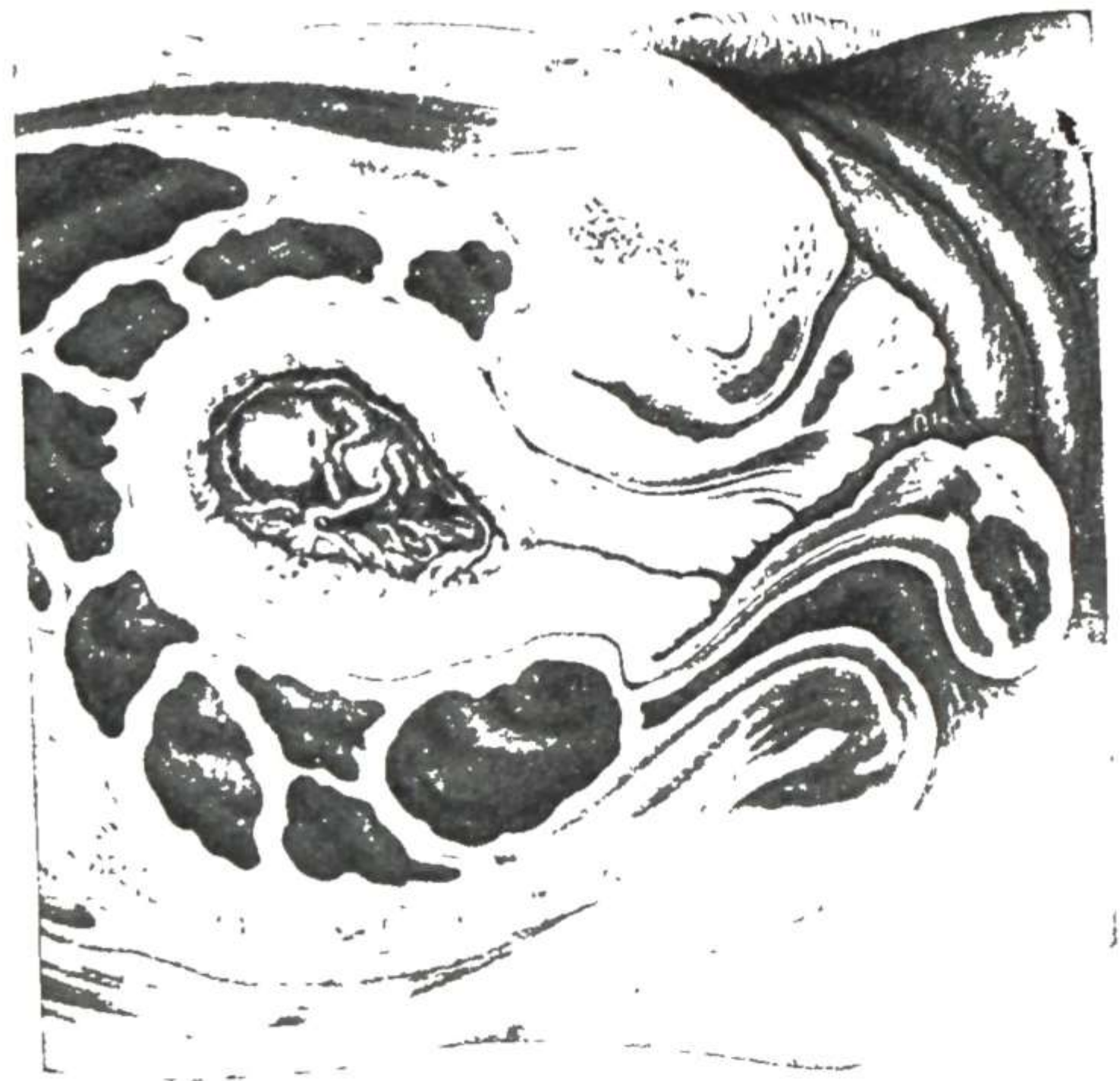
Fig. 607.

Fig. 608.

Fig. 607.—Early pregnancy with marked retrodisplacement of uterus.
Fig. 608.—Early pregnancy with moderate retrodisplacement of uterus.   (From Edgar: Practice of Obstetrics.)
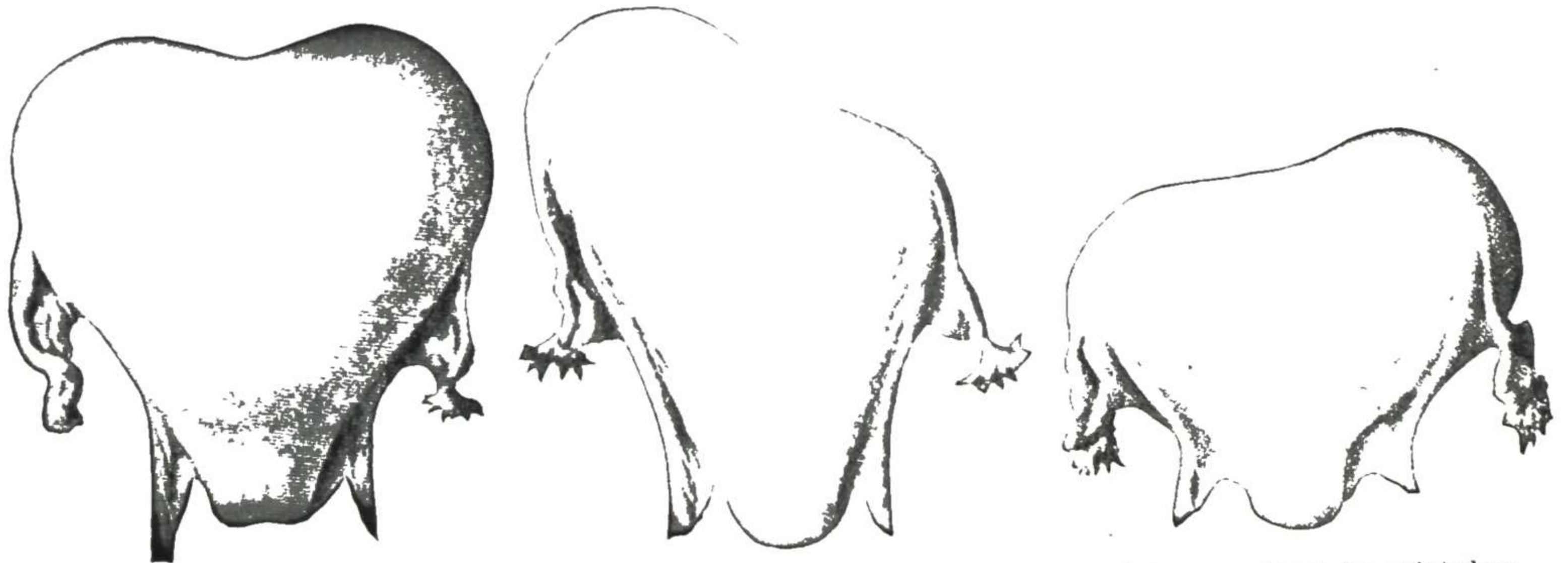

Fig. 609.—Irregular shapes that pregnant uteri may present, and which may lead to mistakes in diagnosis.   (From Edgar: Practice of Obstetrics.)
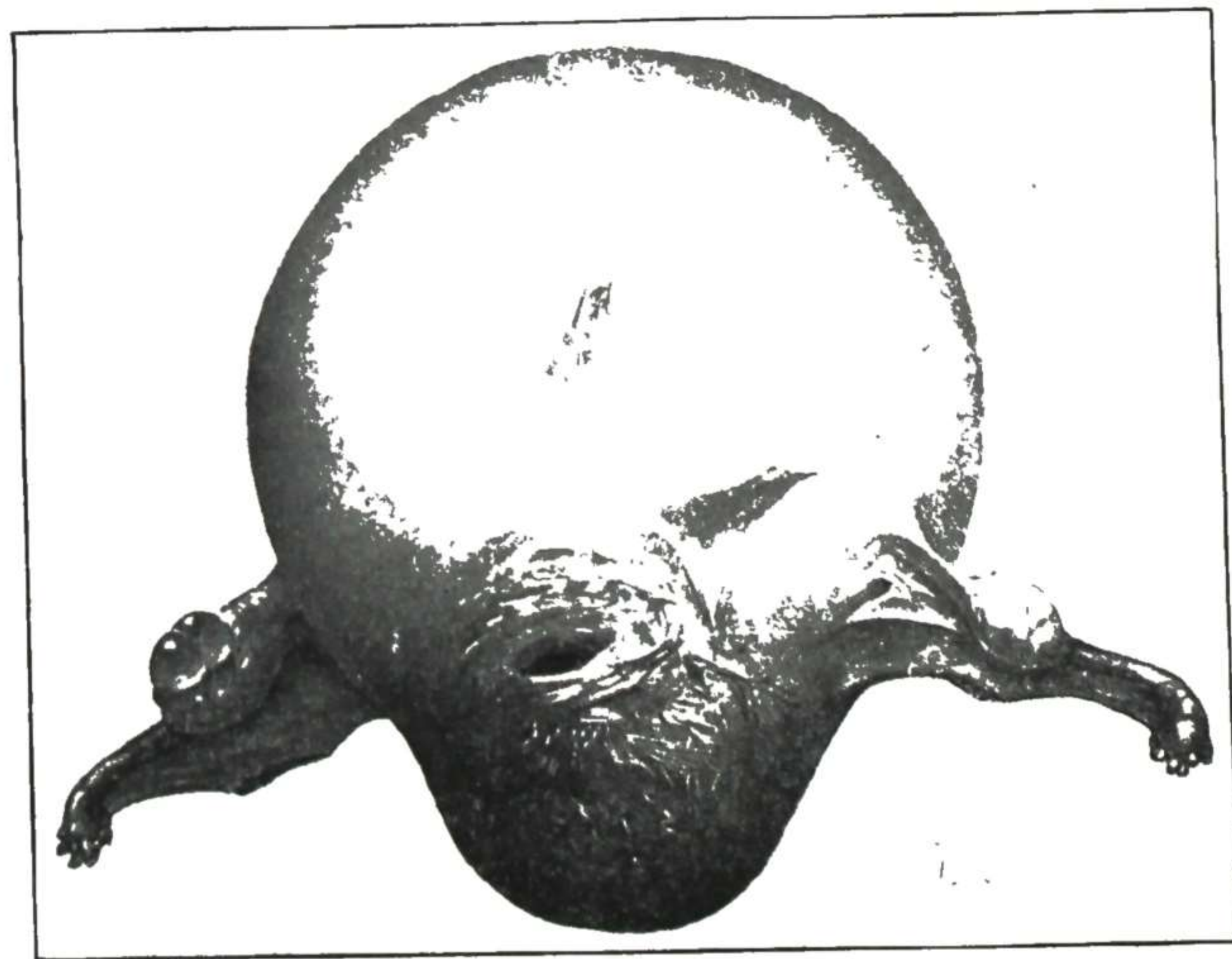

Fig. 610.—Uterus symmetrically enlarged from myomas.   This might be mistaken for a pregnant uterus, on account of the close resemblance in shape.   (From Kelly: Operative Gynecology.)

areas of the pregnant uterus and contained fetus. An interesting article could be written on the prenatal care and obstetric waiting hours expended on large myomas. Dr. H. S. Crossen recalls particularly one such case in which he was called in consultation the second day of "labor."

B. OTHER DISEASES PRESENTING A MASS OR INDURATION, which may be mistaken for a myoma. The more common of these diseases are salpingitis with exudate, pelvic cellulitis, hydrosalpinx, pregnancy, extrauterine pregnancy.
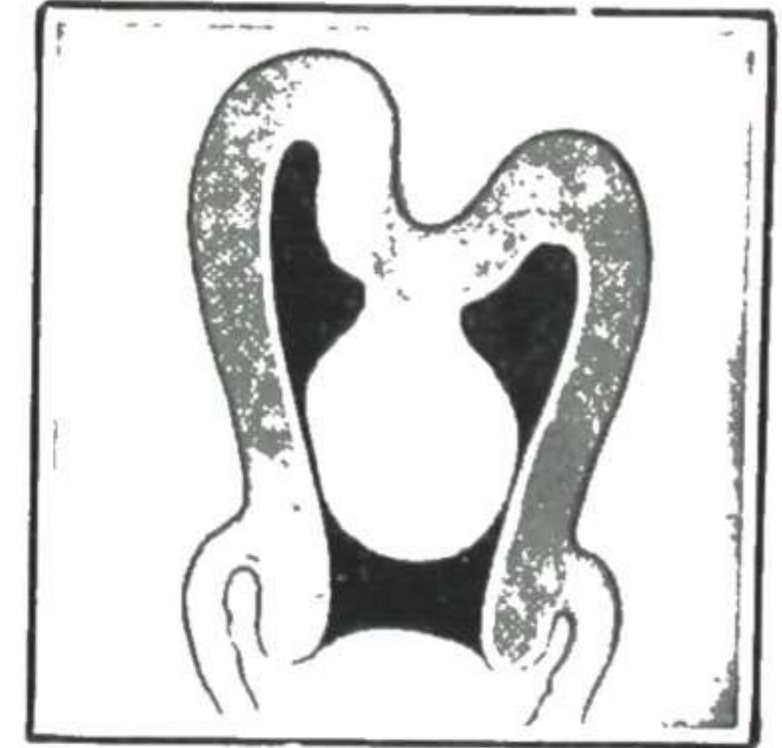

Fig. 611.   Fig. 612.   Fig. 613.

Figs. 611 to 619.—Diagnosis—inversion and pediculated myoma. (From Dudley: Practice of Gynecology, Lea & Febiger.)
Fig. 611.—Beginning inversion of the uterus.
Fig. 612.—Submucous myoma with short pedicle.
Fig. 613.—Submucous myoma and beginning inversion.
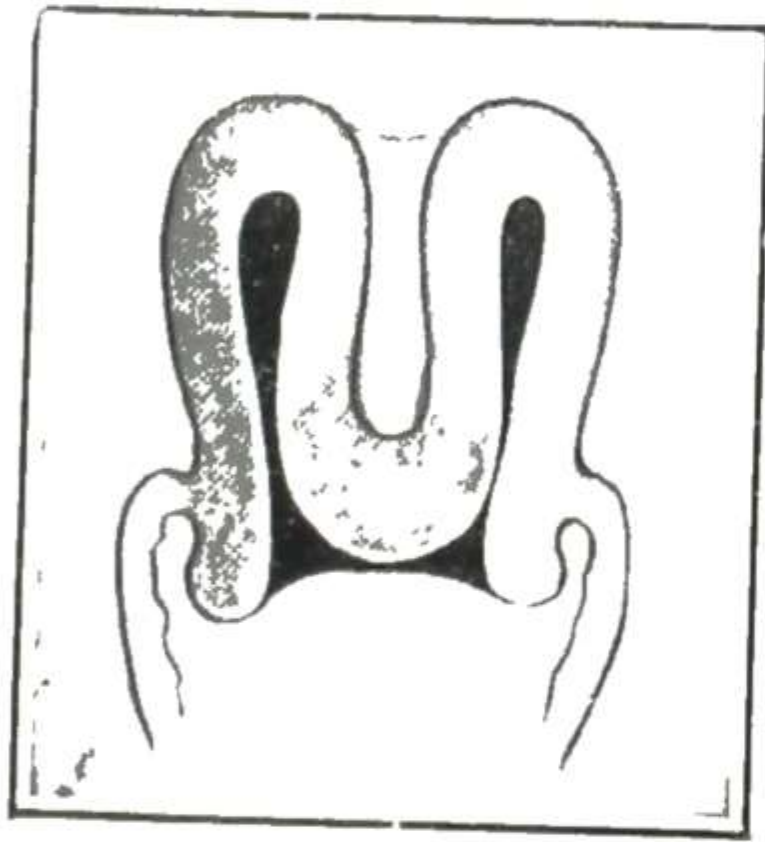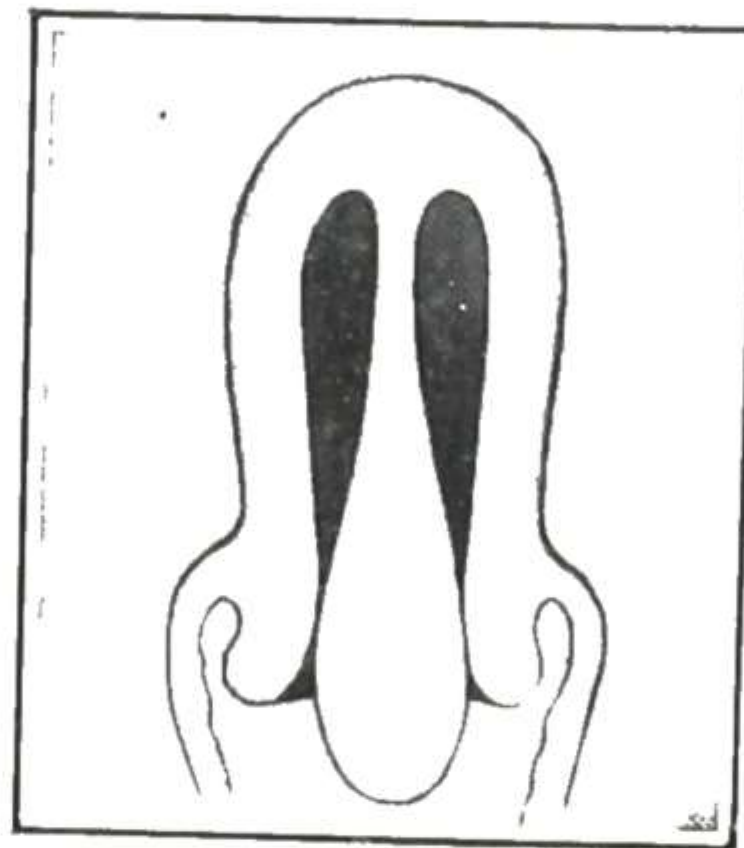

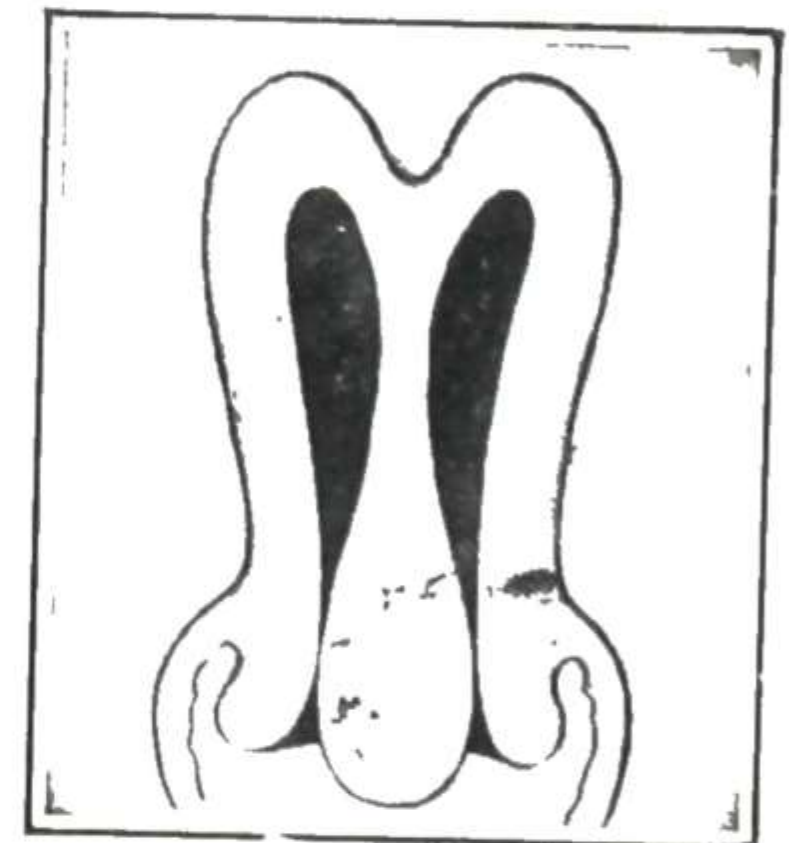Fig. 614.   Fig. 615.   Fig. 616.

Fig. 614.—Partial inversion of uterus.
Fig. 615.—Submucous myoma with long pedicle.
Fig. 616.—Pediculated myoma and partial inversion.
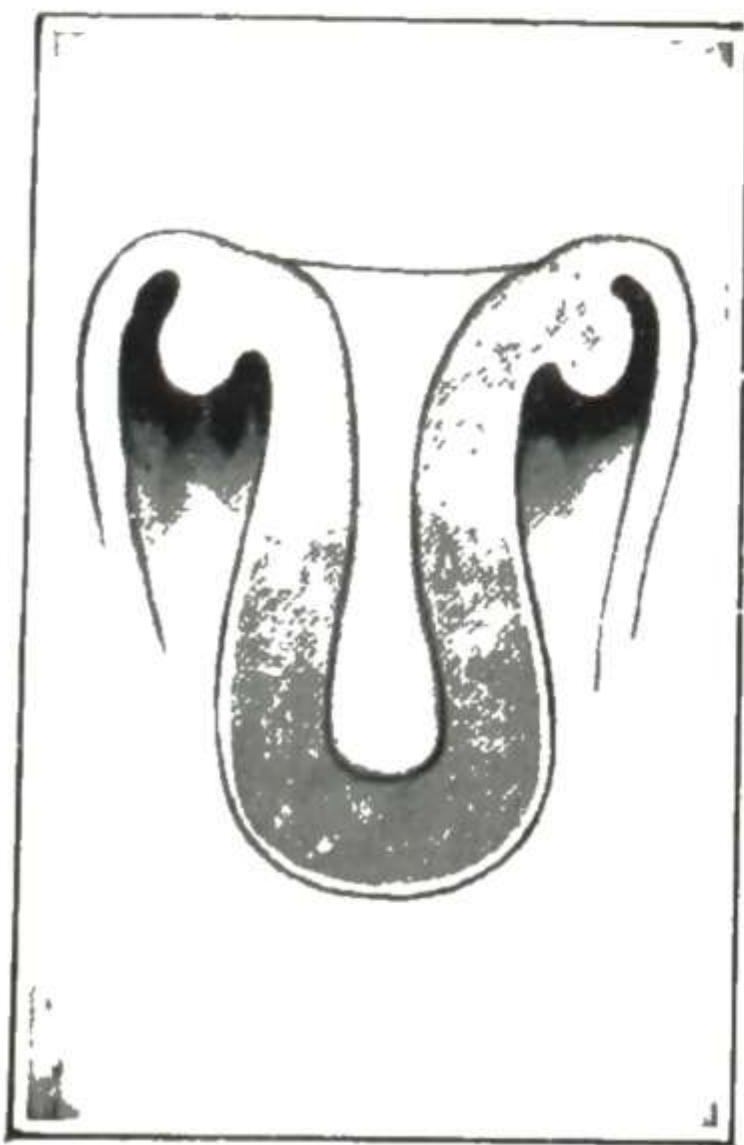

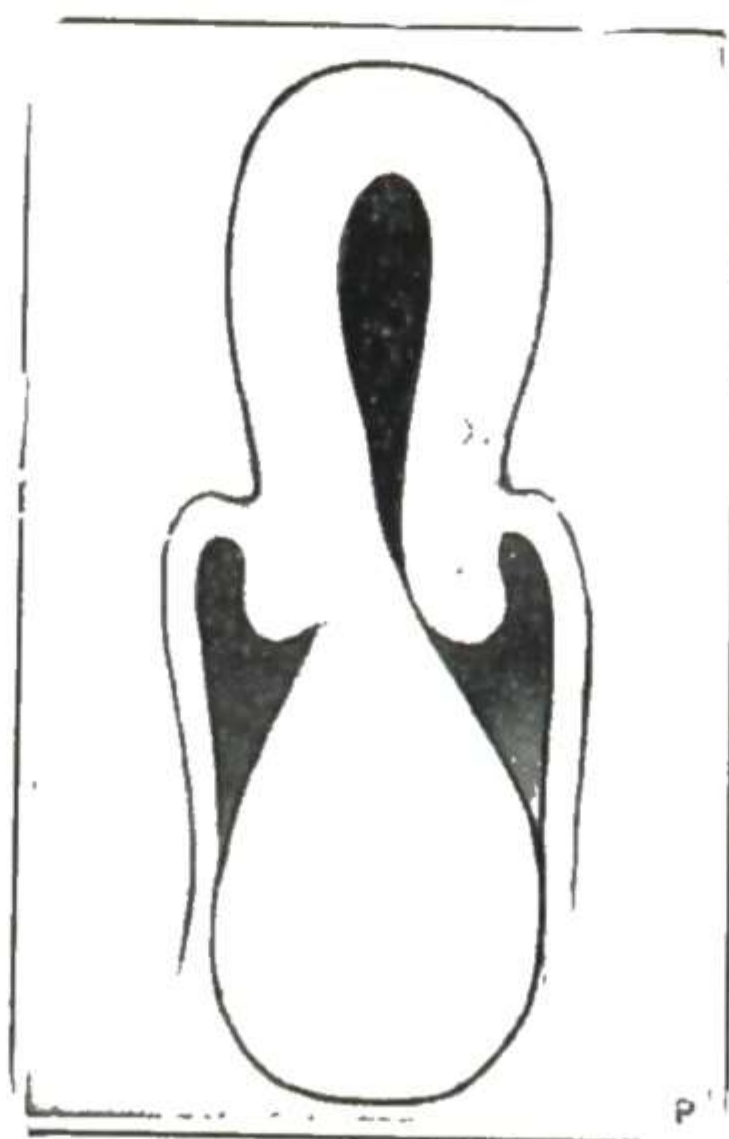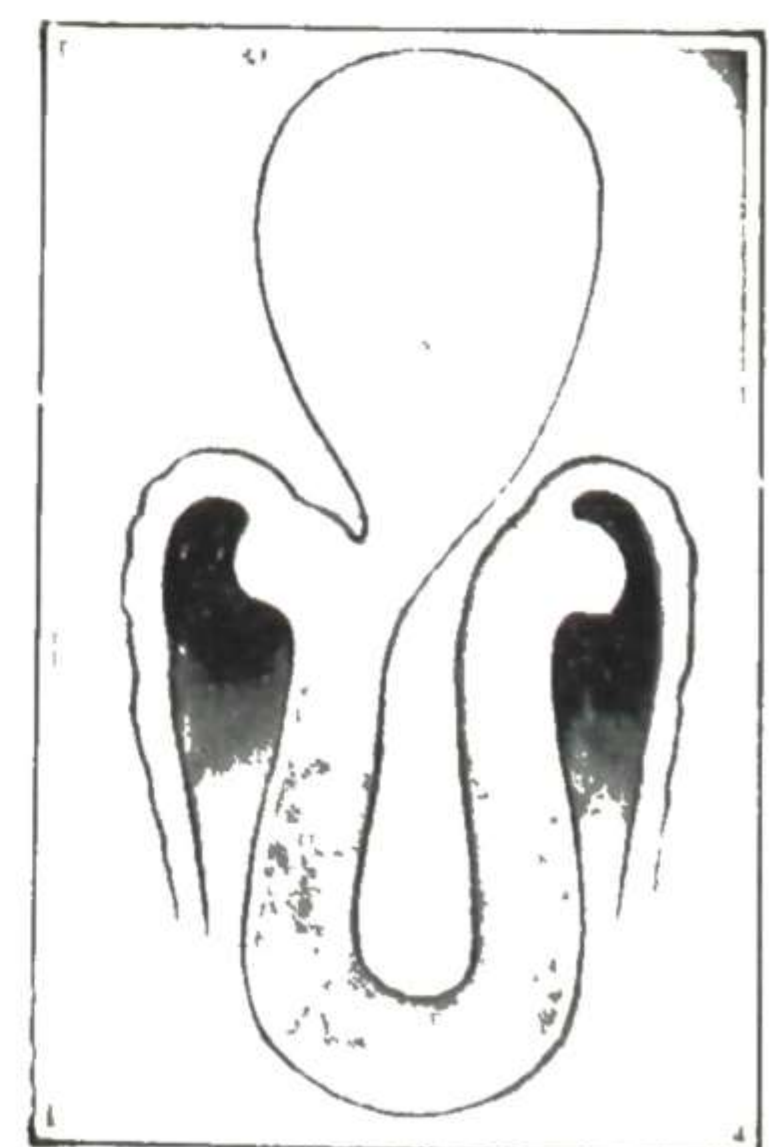Fig. 617.   Fig. 618.   Fig. 619.

Fig. 617.—Complete inversion of uterus.
Fig. 618.—Pediculated myoma filling upper part of vagina.
Fig. 619.—Complete inversion of uterus, with a pediculated subperitoneal myoma occupying the normal site of the uterus.

Fig. 607.
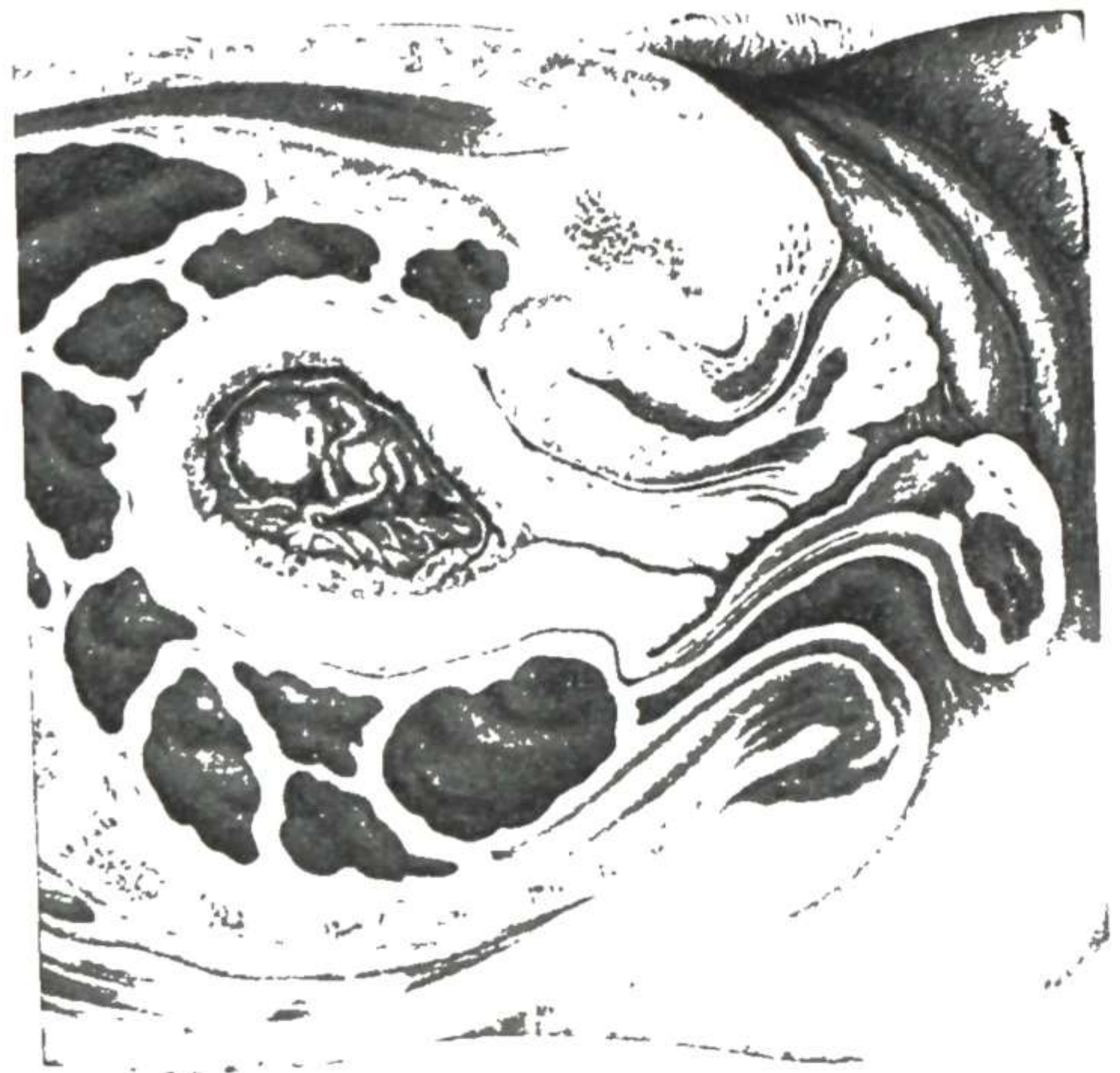
Fig. 608.

Fig. 607.—Early pregnancy with marked retrodisplacement of uterus.
Fig. 608.—Early pregnancy with moderate retrodisplacement of uterus. (From Edgar: Practice of Obstetrics.)
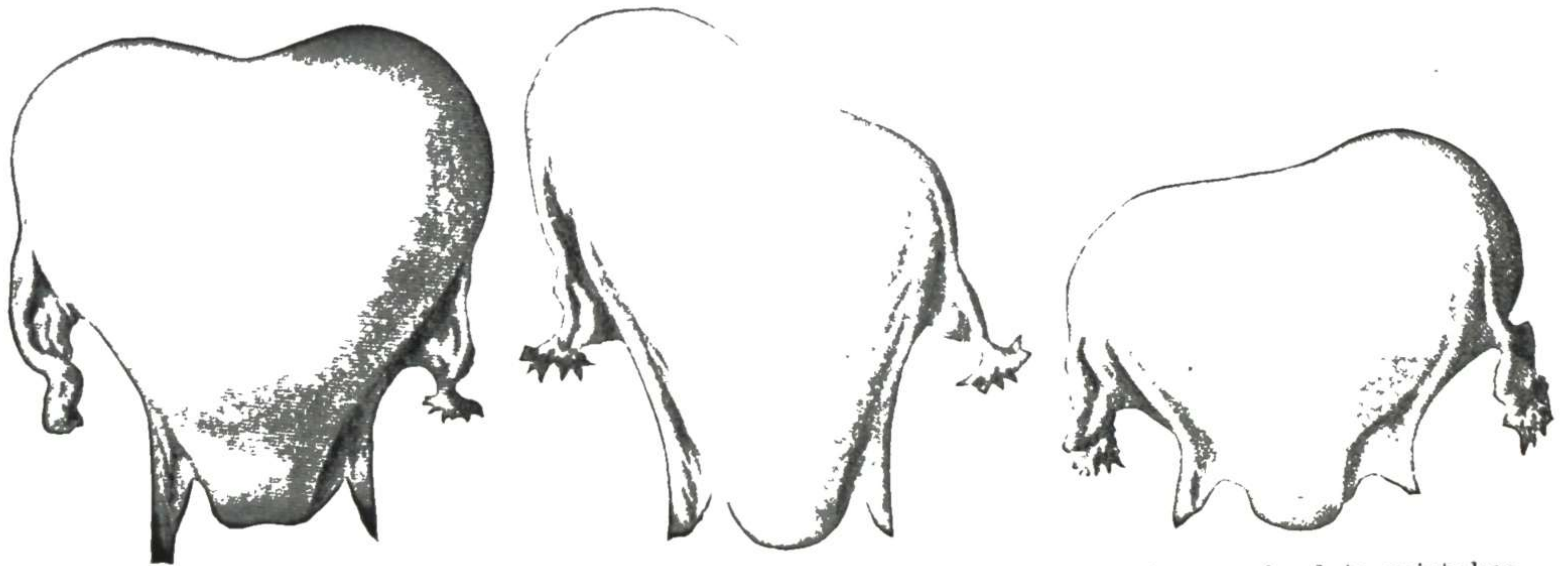
Fig. 609.—Irregular shapes that pregnant uteri may present, and which may lead to mistakes in diagnosis. (From Edgar: Practice of Obstetrics.)
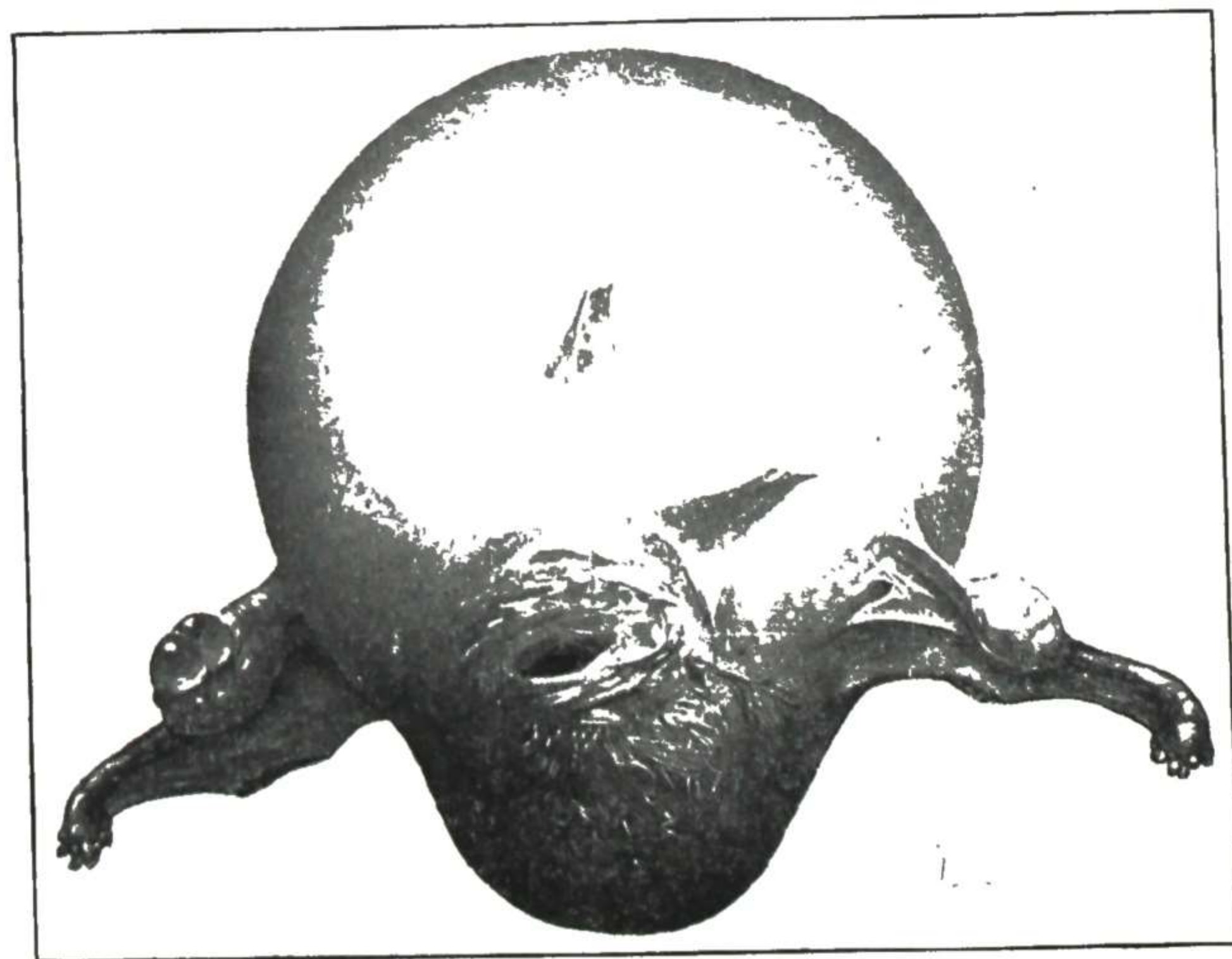
Fig. 610.—Uterus symmetrically enlarged from myomas. This might be mistaken for a pregnant uterus, on account of the close resemblance in shape. (From Kelly: Operative Gynecology.)

estimating the prognosis in the case. Before any operative work is decided upon, a thorough medical investigation, to determine the operative risk, should be done.

In the menopause Zeit estimates that only four out of every 100 cases with myoma give symptoms serious enough to warrant operative therapy. He stresses the importance of determining the cause of the bleeding by curettage before resorting to abdominal surgery, for he found in his series that there were many other causes for the bleeding, such as polyps or endometrial or cervical cancer, in which hysterectomy was either not needed or was exactly the wrong treatment for the condition present. Tumors under the size of a 2½ month pregnancy rarely give trouble; larger ones should be observed or removed depending upon the factors in the individual case.

Treatment

In regard to treatment there are three propositions to be considered: (A) no treatment, (B) conservative treatment, and (C) operative treatment.

A. No Treatment

A certain small percentage of myomas are discovered by accident, i.e., during a pelvic examination for symptoms not due to the fibroid. The myoma is small, has caused no symptoms, is not likely to cause symptoms soon, and is not likely to aggravate the symptoms due to the other trouble.

Such a tumor requires no treatment. The patient should, however, be kept under observation, to see whether there is any increase in the growth.

There is one class of small myomas that the authors feel constitutes an exception to this rule. When situated in the lower part of the uterus, a myoma of any considerable size is a dangerous matter in the childbearing period. If pregnancy should take place, the tumor will probably increase in size and may become a serious menace to labor at term. Again, a cervical myoma is likely to cause symptoms (bladder, rectal, or menstrual) at any time, even though small. Such a tumor in a married woman should be removed. If not complicated by tumors elsewhere in the uterus, it may be approached from the vagina and removed by a comparatively simple operation.

B. Conservative Treatment

Conservative treatment is directed toward relieving the symptoms caused by the fibroid, such as bleeding and pressure; checkup examinations are also important so that operative interference can be carried out if necessary.

The question as to whether the patient should be told that she has a fibroid is one in which there is some difference of opinion. The older gynecologists felt it was better as a rule not to tell the patient, and this is still a good plan for women who tend to worry a great deal. I feel that in most cases, however, it is important to take time to explain to the patient that she has a myoma, that it is of frequent occurrence and rarely needs operation, and that if she will be checked regularly she will be perfectly safe and will probably go through a normal life and into the menopause without serious trouble. If the patient is not told and she is examined elsewhere, she will feel that you have missed a serious condition, and if the new physician has not had the proper

training in conservatism, she is apt to find herself minus her uterus. A plea for more conservative management of myomas is made in a recent article by Mauzy, Lock, and Donnelly.

If the menses are prolonged or profuse, or if the interval is too short and endocrine factors have been eliminated, the patient should be given ergotrate with the flow. In general the diet should be adequate in protein, vitamins and iron. Additional iron in the form of ferrous sulfate, and additional vitamins B and C, and, in some cases, K, are beneficial. Contrary to all experimental evidence, we have found in our experience of many years that mammary Emplets taken twice daily will frequently space the periods and reduce the amount and length of the flow. Progesterone and androgen administration has been found to be beneficial in some cases, but these are expensive and the result is temporary. In persistent bleeding curettage is indicated.

C. Operative Treatment

Operative treatment in the childbearing age should be conservative if possible. Curettage has been mentioned; if abdominal operation is necessary and the patient is desirous of having more children, myomectomy should be done if the location of the tumors permits. Bonney's excellent monograph on "Extended Myomectomy and Ovarian Cystectomy" illustrates what can be accomplished by this conservative procedure. The advantages and disadvantages of abdominal myomectomy are ably discussed in a recent article by Munnell and Martin and also in one by Davids. In patients in the late childbearing age and in those where the operative difficulties preclude saving enough of the uterus for pregnancy, preservation of enough of the endometrium for menstruation is usually possible. This is important both for prolonging the ovarian activity and from a psychological standpoint. The idea that menstruation is necessary for continuing sexual response is so deeply ingrained in the mind of most lay persons (wife and husband) that they conclude the cessation of menstrual function is synonomous with loss of sexual attraction.

In women over forty with small or medium-sized tumors we have the choice of hysterectomy or radiation. If the patient is a good risk, hysterectomy is preferable, but in patients who wish to avoid a major operative procedure or in patients who for some reason are not good operative risks, radiation in carefully selected cases gives excellent results (90 per cent in our series) with a minimum amount of risk and expense.

Radium.—Painful conditions in the pelvis are not likely to be relieved by radiation. Consequently when the myoma is causing pressure pains, on account of size or location, or when there are inflammatory or other conditions making pain a prominent symptom, operation is preferable.

In patients with kidney, heart, and other complications giving undue operative risk, radium may reasonably be tried in the somewhat larger growths. In these complicated cases, also, carcinoma of the endometrium should be excluded by curettage, if possible. Of course, in these seriously complicated cases, general anesthesia is to be avoided. In the authors' experience the curettage and radium application may in most of these cases be accom-

plished under morphia-hyoscine analgesia. In the exceptional cases where necessary this analgesia may be supplemented by local infiltration anesthesia of the cervix.

In the handling of radium cases we have developed a special method of suturing the radium in place, so as to facilitate easy removal. The details are as follows:

Special suture facilitating removal: After introduction, the radium is fastened securely in place by a suture passing first through one side of the cervix, then through the rubber tubing, and finally through the other side of the cervix, as shown in Figs. 622 and 623. The suture is not tied at this time. The ends are left long, and later are tied over the vaginal
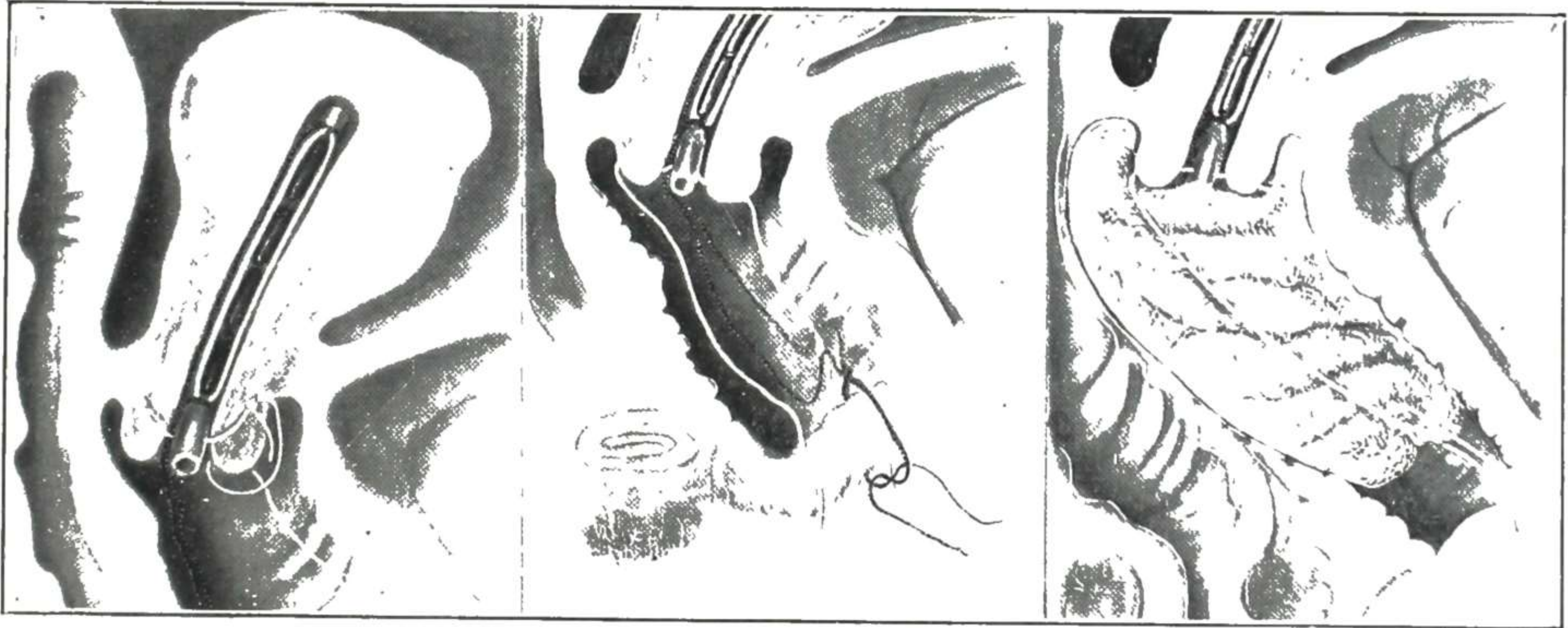

Fig. 622.   Fig. 623.   Fig. 624.

Fig. 622.—Radium implantation for myoma. Fastening the radium package securely in the uterus by a method which permits easy removal with very little disturbance to the patient. Passing the suture through the cervix and the rubber tubing.

Fig. 623.—Suture passed, and ends left long and brought outside. The end of the gauze packing is tied to the radium string.

Fig. 624.—The packing in place and the suture tied over the packing. This is the only knot in the suture. This arrangement holds the packing in place and also permits easy removal later.

Fig. 625.   Fig. 626.   Fig. 627.

Fig. 625.—Removal of the radium. Cutting the suture over the gauze packing near the vaginal entrance. This releases the suture, so that it may be pulled out, and also releases the packing and the radium, as explained in the text.

Fig. 626.—Removing the packing. As the end of the packing comes out, it brings out the radium string which is tied to it.

Fig. 627.—The radium string brought out. Then a firm steady pull on the string brings out the radium package.

packing. A moderate vaginal packing is then placed, the bulk of it being back of the cervix to push away the rectum and posterior vaginal vault (Fig. 624). It is not necessary in these myoma cases to push the bladder and rectum far away by an extremely tight packing requiring a retained catheter, as must be done in carcinoma of the cervix on account of the large dosage necessary and the location of the radium.

It is well to use petrolatum gauze for this packing, so as to avoid the vaginal irritation resulting from ordinary gauze pressed against the vaginal wall for a considerable period. After the packing is in place, the ends of the holding suture are tied over, as shown in Fig. 625. This method of arranging the suture is to facilitate easy removal of the radium without much disturbance of the patient.

Removal of radium: One hour before the time for the radium removal the patient is given a hypodermic of ¼ grain of morphine and one ampoule of hyoscine. At the time of removal the patient's hips are brought to the edge of the bed, the end of the suture is caught with a forceps, and the suture-loop over the gauze is brought into view (with or without a speculum as needed) and cut with scissors (Fig. 625). Then a pull with the forceps holding the suture end will pull out the whole suture, as there is no knot in it. This releases the packing and the radium, which are then removed (Figs. 626 and 627).

AFTERCARE.—On account of the circulatory and other disturbance from the curettage and radium treatment, often combined with conization, the patient is kept in bed a couple of days. If there is no special local disturbance, she is then allowed up, and the activity is gradually increased so that she is ready to go home in from three to six days after the radium is removed. The main object is not getting the patient home quickly, but giving the radium treatment safely and with minimum deleterious effect. Undue early activity, adding congestion to that already present from the radium treatment, may cause local disturbance that would not otherwise occur.

X-ray.—The very large growths in patients presenting undue operative risk are best handled by deep x-ray therapy. In most cases this will, after a time, stop the bleeding temporarily and give a chance to build up the patient for operation. If she cannot be gotten into condition for operation, continuation of the x-ray treatment may stop the bleeding permanently and diminish pressure symptoms by shrinking the growth.

If preferred, the smaller growths also may be treated by x-ray instead of radium, if the patient has had a recent curettage excluding malignancy.

DETAILS OF THE FIVE HUNDRED AND TWENTY-SIX MYOMA RADIATION CASES.

Size of the myomatous uteri			
Fist-sized or smaller	456	Failures	31
Grapefruit-sized	53	Failures	5
Near to umbilicus	17	Failures	0
Dosage			
1,200 to 2,400 mg. hr., depending on size and other factors			
Spot-devitalization and metritis in 7 cases			
Advise moderate dosage, and supplement later if needed			
Supplementary radiation required in 23 cases with successful results			
Symptoms			
Cases with bleeding, 507 (96%); all but 14 were successful			
In the 19 nonbleeding cases—dysmenorrhea, 4; ovulation pain, 1; pruritus vulvae, 1; worried about the tumor, 1; pressure discomfort, discharge, 12			
Pain; ordinarily pain makes the case unfavorable; there are some exceptions			
Ages of patients			
Under 40		36	(7%)
40 to 50		318	(61%)
50 to 60		161	(30%)
Over 60		11	(2%)

Delayed menopause (age 48 to 58) has a sinister significance; in this series three-fourths of the endometrial carcinomas occurred in the age period 48 to 58.

An analysis of our results with radiation in over 500 cases of uterine myoma was reported in 1947. In the accompanying tables are shown the results of treatment and a comparison of the occurrence of cancer in radiated and nonradiated myomas, respectively. As can be seen, cancer of the endometrium and of the ovary occurred one-half as frequently in the myomas that had been radiated as they did in those which were not radiated. Most of the recent series on the occurrence of cancer after radiation have failed to consider several very important points. In some of these series the patients who subsequently developed endometrial carcinoma had had no curettage done prior to or with the radiation treatment; hence these patients could well have had an early carcinoma which was masked and inhibited but not destroyed by the radiation. This was especially true in the cases receiving x-ray. Second, they include in their series all types of benign lesions receiving radiation and do not compare myoma cases with myoma cases. In a carefully followed series of 986 patients reported by Costolow the incidence of subsequent uterine carcinoma was only 0.4 per cent.

Hundley et al. in a series of 225 patients given radium for benign bleeding had only one subsequent endometrial carcinoma, and they quote from a vital statistical study made by Ross Cameron for the U. S. Public Health Service. In this study of 225 women who had had radiation for benign bleeding he found an incidence of subsequent endometrial carcinoma of 0.44 case per 100 population, which is significantly less than the normal expectancy, which is 2.5 cases per 100 population.

From our statistics as well as those of the above-mentioned authors, it is apparent that not only is there no increase in the incidence of subsequent endometrial carcinoma but actually the rate is lower than the normal expectancy in untreated cases.

RATIO OF CANCERS IN 2,662 CASES OF UTERINE MYOMA

Cancer of endometrium		
In 2,136 nonradiated cases of myoma	37	(1.7%)
In 526 radiated cases of myoma	4	(0.7%)
Cancer of ovary		
In 2,136 nonradiated cases of myoma	13	(0.68%)
In 526 radiated cases of myoma	1	(0.19%)

Each type of cancer was more than twice as frequent in the nonradiated cases as in the radiated.

The action of the radiation in treating myoma of the uterus in women over forty is directed to the ovary, and by stopping ovarian function the myoma is affected indirectly. In young women where it is important to preserve the menses and the childbearing function, x-ray can be given to the tumor while the ovarian regions are protected with lead sheeting. Pfahler in 1947 reviewed the literature on this type of treatment and reported a number of successful pregnancies following this type of therapy, including his own cases.

Operation.—Operative removal of the myoma is the preferable form of treatment in three classes of cases, as follows:

1. The large growths, from the size of a grapefruit and upward, are generally best handled by operation. It is not practicable to fix an arbitrary limit of size, as other con-

ditions have a bearing on the decision. For example, pediculated subperitoneal growths are not so favorable for radium or x-ray treatment as growths embedded in the uterine wall and hence must more often be removed by operation. Again, a single large growth is not so favorable for nonoperative treatment as a myomatous uterus enlarged to the same size by a number of small nodules.

2. In young women in whom preservation of the childbearing function and of menstruation is desirable, myomectomy is the preferable form of treatment, where any serious treatment at all is necessary. In many of these cases the myomas may be removed without disturbing the functions of the uterus. A point to be kept in mind, however, is that when the abdomen is opened it *may* be found necessary to sacrifice the uterus in order to remove the tumors completely. Hence myomectomy should be advised only after careful consideration of all the features of the case. If the growths are not of a size and location necessarily interfering with pregnancy or labor, it would be well to try first to check the bleeding by other means, such as curettage and internal medication. If these measures fail, it may be advisable in exceptional cases to employ light doses of radium or x-ray, with the idea of giving just enough to control abnormal bleeding but not enough to affect ovarian or uterine function seriously. But in spite of advances made in the regulation of dosage and the enthusiastic assumptions of some authorities, this use of these measures must be with very decided caution. If the x-ray is used, it is preferable to apply it to one side only, so that one ovary will remain unaffected.
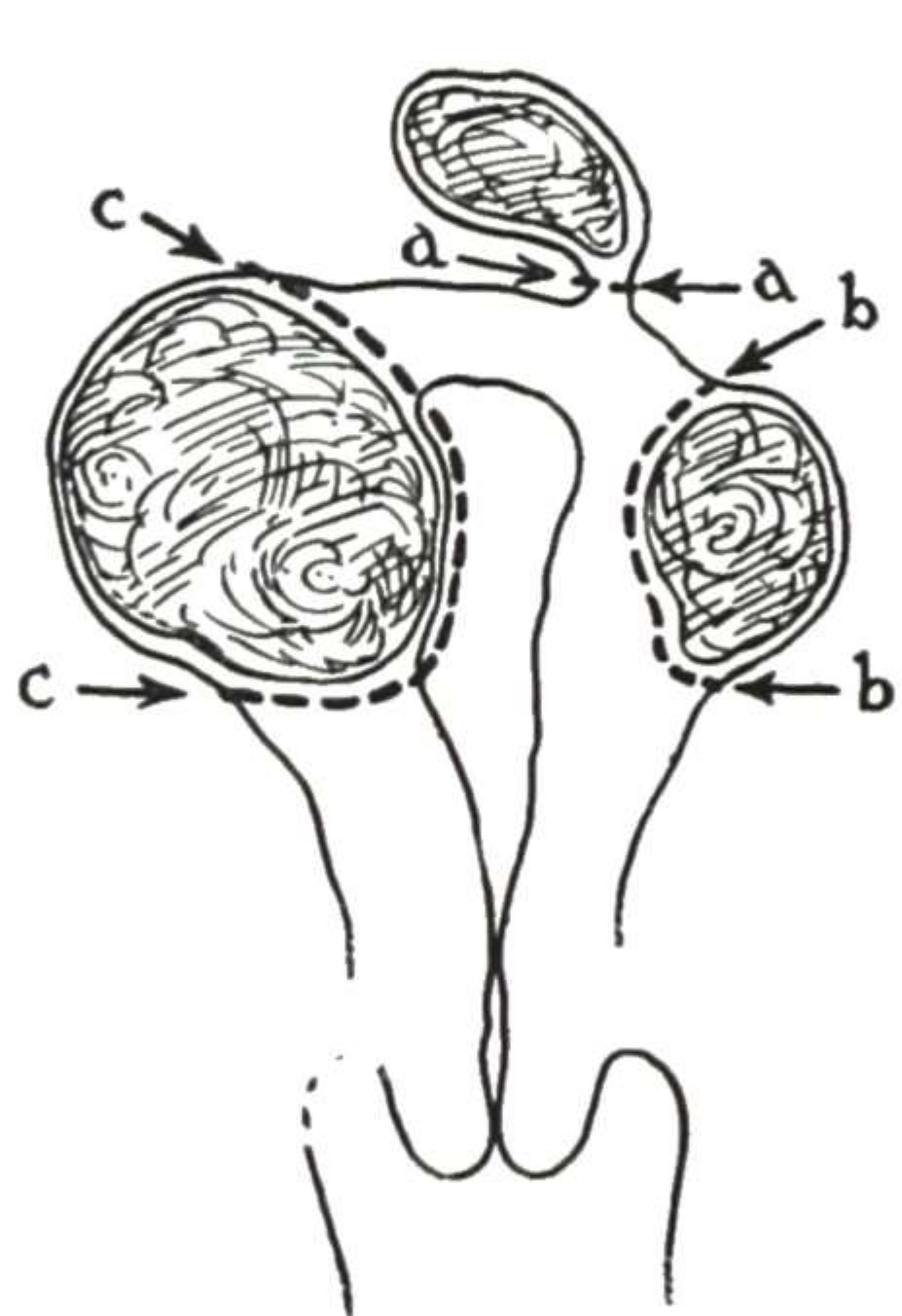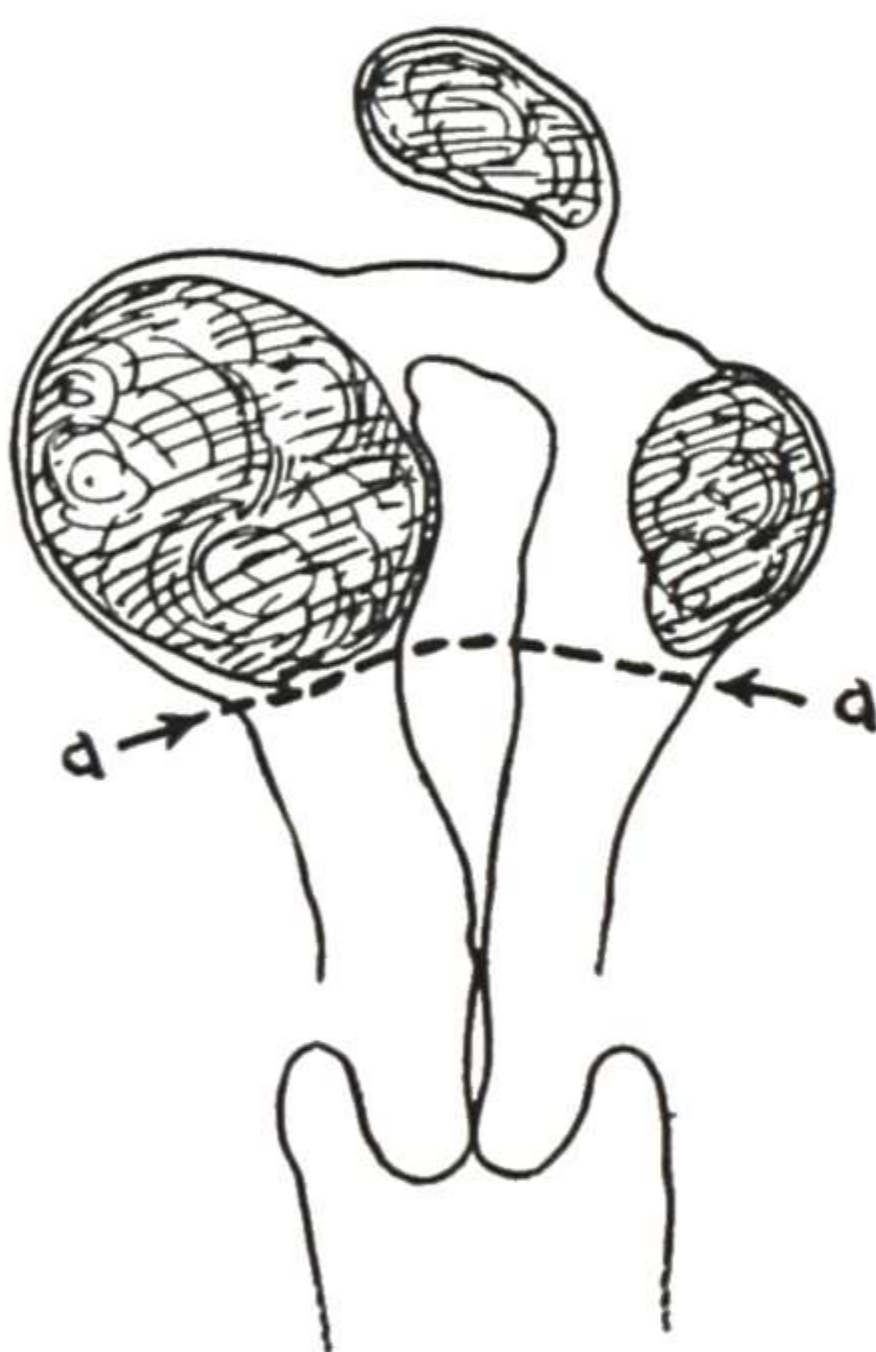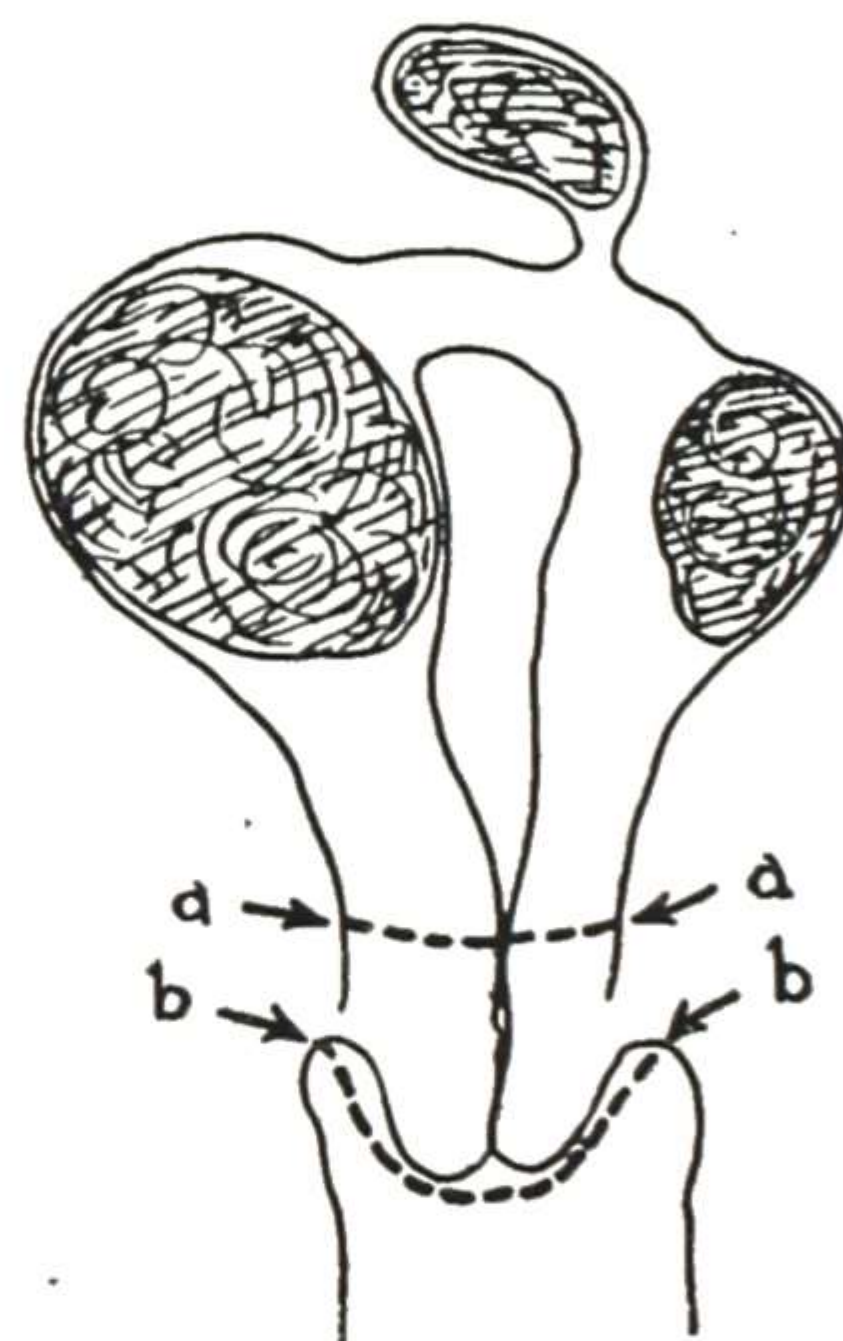

Fig. 628.   Fig. 629.   Fig. 630.

Figs. 628 to 630.—The principles involved in the different types of abdominal operation for uterine myoma. Fig. 628, Myomectomy—for a pediculated subperitoneal myoma, for a sessile subperitoneal myoma, and for a myoma that extends to endometrium. Fig. 629, Partial hysterectomy—preserving a considerable part of the corpus uteri and endometrium in the hope of preserving menstruation. Fig. 630, Hysterectomy—supravaginal hysterectomy and complete hysterectomy.

3. In complicated cases the complications often make operation advisable in a growth which if uncomplicated would be suitable for radium or x-ray treatment. The complication may be inflammation of some adjacent structure, for example, appendicitis or salpingitis. Such associated trouble is found in a considerable proportion of the cases of myoma. The complication may be inflammation or degeneration of the myoma itself. Degeneration is common in the larger growths, especially in the subperitoneal masses. A myoma that takes on growth after the menopause is probably undergoing a degenerative change of some kind and should be promptly removed if the patient is a safe operative risk.

The various operative measures looking to the removal of the growth are as follows (Figs. 628 to 630):

Myomectomy.—Removal of the tumor or tumors and preservation of the uterus.

ABDOMINAL MYOMECTOMY.—Enucleation from the outer surface of the uterus.

VAGINAL MYOMECTOMY.—Enucleation from the cervix or from within the uterus by splitting the cervix.

Total Hysterectomy.—Removal of the tumor and of the entire uterus, including the cervix. This is carried out through the abdomen or through the vagina, as thought best in the particular case.

Supravaginal Hysterectomy.—Removal of the tumor and of the body of the uterus, leaving the cervix. This is, of course, carried out through the abdomen and is ordinarily employed only when there is some contraindication to complete hysterectomy. Conization should always be done when it is necessary to leave the cervix.

In regard to hysterectomy, if it is necessary in young women, the ovaries should of course be saved, but when it is necessary in women at or near the menopause it is our feeling that both ovaries should be removed. There are several reasons for this change from the attitude of fifteen years ago. First, the former effort to conserve the ovaries was based on the desire to prevent the changes which come with the cessation of menses and the menopause. This can now be done with hormones, which can be given by mouth and thus controlled. Second, because of the insidious onset of ovarian carcinoma, with few symptoms to indicate its presence until it has become inoperable, we feel that it is better to get rid of these involuting organs with their carcinoma potential while the abdomen is open. Our experiences on this subject have been summed up in an article on "The Cancer Potential in Involuting Organs," written in 1948.

PREGNANCY AND MYOMA

The incidence of myoma complicating pregnancy in eight reported series averaged 0.84 per cent. Buckell in a series reported from England found an incidence of 0.79 per cent. In a series in which 66 per cent of the cases were Negroes, Grandin found an incidence of 2.1 per cent.

The relationship of pregnancy and myoma is an important subject and it might be well to discuss at this point the various problems involved.

In the first place, the incidence of sterility is higher in myoma cases than it is in the general population. The endometrium over a submucous fibroid is usually thinned out, making a poor nidus for implantation. Should the ovum implant, there is a tendency for it to be aborted with the following period because of the increased flow and also because the intramural fibroid acts as an irritant, causing increased contractions in some cases. This is contrary to the findings of Thompson. In his masterful statistical review of 2,000 consecutive private deliveries, 144 of the labors were in myoma cases and the incidence of miscarriages was less in cases with fibroid than in cases without fibroids.

As Davis has recently emphasized, most cases of myoma complicated by pregnancy will go through pregnancy without serious complications and deliver through the normal passages. However, if the pregnancy does not interrupt early there are complications which may occur later. As the preg-

nancy progresses, in retrodisplacement of myomatous uteri or if the myoma is in the cul-de-sac, the uterus or the myoma may become incarcerated in the true pelvis and must be released or the patient will usually abort. The treatment in these cases is as follows: Knee-chest exercise, insertion of the mercury bag, or manual dislodgement of the uterus and myoma at intervals, until the uterus is large enough to prevent it from dropping back behind the promontory of the sacrum into the true pelvis. In some cases, the temporary use of the pessary aids in accomplishing this. When a patient, seen for the first time at three or four months, has an immovable, incarcerated fibroid, treatment depends on symptoms. If the condition causes periodic bleeding and cramps and it is evident that an abortion is probable, correction by abdominal operation is indicated. The question as to whether a myomectomy is done or whether the uterus is merely released depends upon the findings at operation, the age of the patient, and whether or not this is the only child that this patient is apt to be able to produce. For instance, if the tumor is an isolated one and seems to be superficial and the patient is fairly young and apt to have more children should this pregnancy abort, myomectomy should be carried out taking particular care not to invade the uterine cavity. If she is an elderly primipara, whose chance of future offspring is definitely limited, merely releasing the tumor and uterus at this time would give a better chance of carrying the pregnancy to term. If complications occurred at the time of labor, cesarean section with additional operative treatment for the fibroids could be done and the patient would then obtain a living child. Another complication which sometimes necessitates operative interference during pregnancy is a peculiar degeneration of the myoma which occasionally occurs in pregnancy but may also occur in nonpregnant patients. It is called red degeneration of the circulation to the tumor, which is suddenly cut off, the tumor swells rapidly, and there is hemorrhage into the central portion with rapid onset of necrosis. The tumor is exquisitely tender. Faulkner in an excellent review of this subject advises conservative treatment if the diagnosis is clear. If the symptoms increase in severity, myomectomy may be necessary. A fibroid or associated ovarian cyst with a twisted pedicle must be kept in mind.

Let us now suppose that pregnancy reaches full term with no complications. With the onset of labor the contractions may be erratic and of poor quality due to the presence of numerous intramural myomas. Long labors with primary or secondary inertia are not uncommon. If the tumor is in the cervix, elective cesarean section is usually indicated, though if the tumor is submucous and pedunculated, it can sometimes be removed when dilatation is complete, allowing the presenting part to descend. I have had several cases in which I was able to remove egg-sized fibroids, pedunculated fibroids, prior to delivery from below. While I was in Vienna, Oskar Frankl told me of an interesting case that he had seen in consultation with a former student. In an urgent call for help early one morning, the student explained that in attempting a forceps delivery he had pulled off the infant's head. On arrival Frankl asked to see the head, which his fellow practitioner had hastily wrapped in a towel. On close inspection it was found to be a myoma the size and shape of a fetal head, and while they were rejoicing over error in identi-

fication the patient expelled a yelling male infant without further medical attention. A recent case reported by Scott and Spence is shown in Figs. 631 and 632.

Let us now assume that a patient with a fibroid uterus has successfully completed the first and second stages of labor, the uterus has contracted and
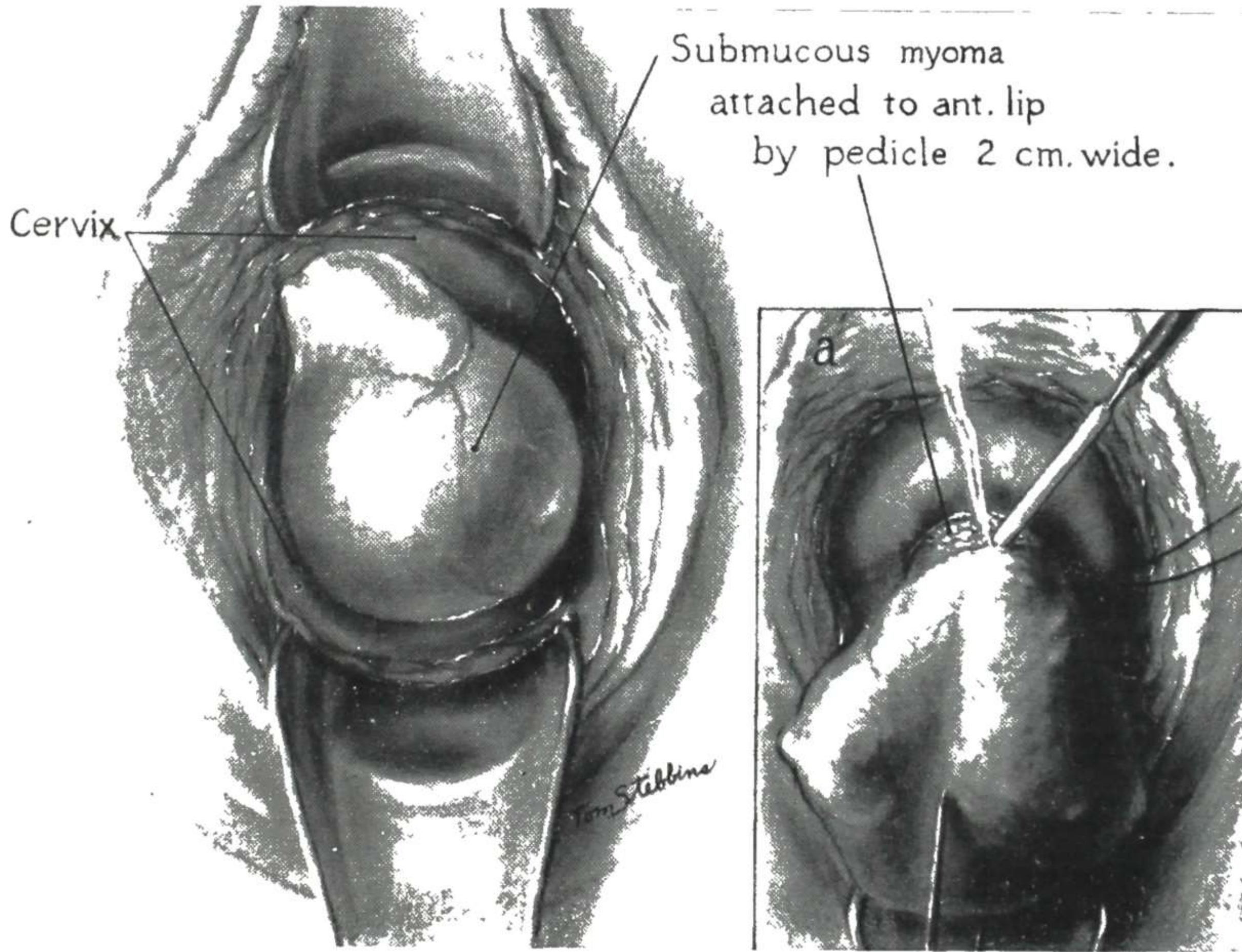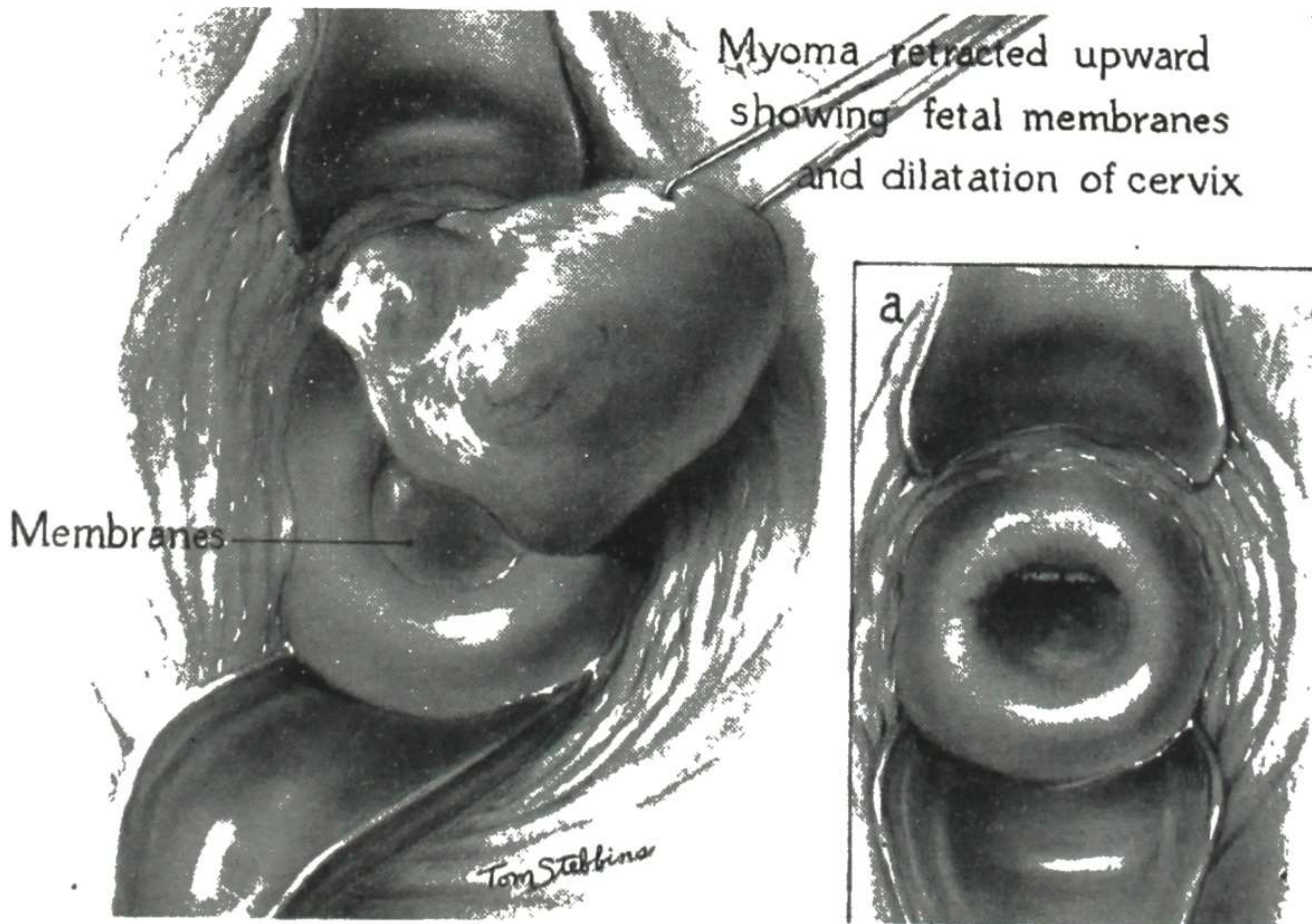

Fig. 631.

Fig. 632.

Figs. 631 and 632.—Removal of submucous cervical myoma during pregnancy. (From Scott and Spence: Am. J. Obst. & Gynec., August, 1951.)

there is a gush of blood but the placenta is not forthcoming. If after a gentle modified Credé, the patient continues to bleed but the placenta still does not appear, the probability is that the portion of the placenta over the fibroid is adherent. In this area the endometrium is thinned out so that there is a poorly formed compact and spongy layer of the decidua and because of this the villi have gone right through the decidua and into the underlying muscle. Under strict asepsis the hand is introduced into the uterus and this area is separated so that the placenta may be expelled. Care is taken with this maneuver not to rupture through the wall of the uterus and it is preferable to leave a thin layer of placenta rather than to dig into the uterine wall. If there is a large area of this placenta accreta, hysterectomy may be advisable.

The question as to whether fibroids enlarge with pregnancy and then involute with involution, was the subject of a study by Randall and Odell. They were unable to find any hypertrophy of the smooth muscle or hyperplasia of the connective tissue stroma of the fibroids during pregnancy. Most of the fibroids showed degenerative changes, and they felt that probably any enlargement of the fibroid could be explained by severe degenerative changes associated with edema. In these cases the patients usually have acute pain. These workers conclude that "any suspected enlargement of asymptomatic fibroids during pregnancy is only apparent."

ADENOMYOSIS (ADENOMYOMA)

Adenomyosis of the uterus is considered in this chapter for, though not a true tumor, the benign invasion of the endometrium into the uterine wall which is characteristic of this disease, does cause an overgrowth of the surrounding uterine muscle and the generally enlarged uterus is frequently confused with a fibroid (Fig. 633). The overgrowth of muscle in the invaded area has no pseudocapsule and cannot be shelled out as a myoma can. Though the condition had previously been described by Rokitansky and by von Recklinghausen, Cullen was the first to emphasize properly its importance as a clinical entity.

The incidence varies in different series; a general average for adenomyosis found in removed uteri would be between 20 and 30 per cent. The disease is most common in women past forty, though Hunter et al. found that about 20 per cent occurred between twenty-seven and forty years of age.

There are numerous theories on the etiology of this condition and there is probably no one theory that explains all cases. The deeply placed islands of endometrial glands and stroma found in the inner two-thirds of the uterine wall are probably due to deep invasion of the basal portion of the endometrial glands which line the uterine cavity. As they invade deeper some of them become pinched off and their openings into the cavity are shut off (Figs. 634 to 636). Meyer showed that the islets of invading stroma destroyed the myometrium, thus opening the way for invasion of the glands. Those found just under the uterine peritoneum are thought to be rests of coelomic or müllerian duct epithelium which have had their potential ability to develop activated. The glands in adenomyosis show the same cyclic changes and decidual changes as do the normally placed glands.

Fig. 633.—Diffuse adenomyosis of uterus, gross specimen. The entire uterus shows thickening of the walls due to a coarse adenomyomatous growth, as shown in Fig. 635. Gyn. Lab.

Fig. 634.—Section of the wall of specimen shown in Fig. 633. Notice the large gland areas extending through two-thirds of the wall. There is a peculiar coarseness of detail in these areas that causes the photomicrograph to resemble a drawing. Gyn. Lab.

The high incidence of associated hyperplasia of the endometrium (Spatt, 72 per cent) and of myomas (60 to 70 per cent) with adenomyosis points to some endocrine dysfunction causing either the excessive production or inadequate destruction of estrogens.
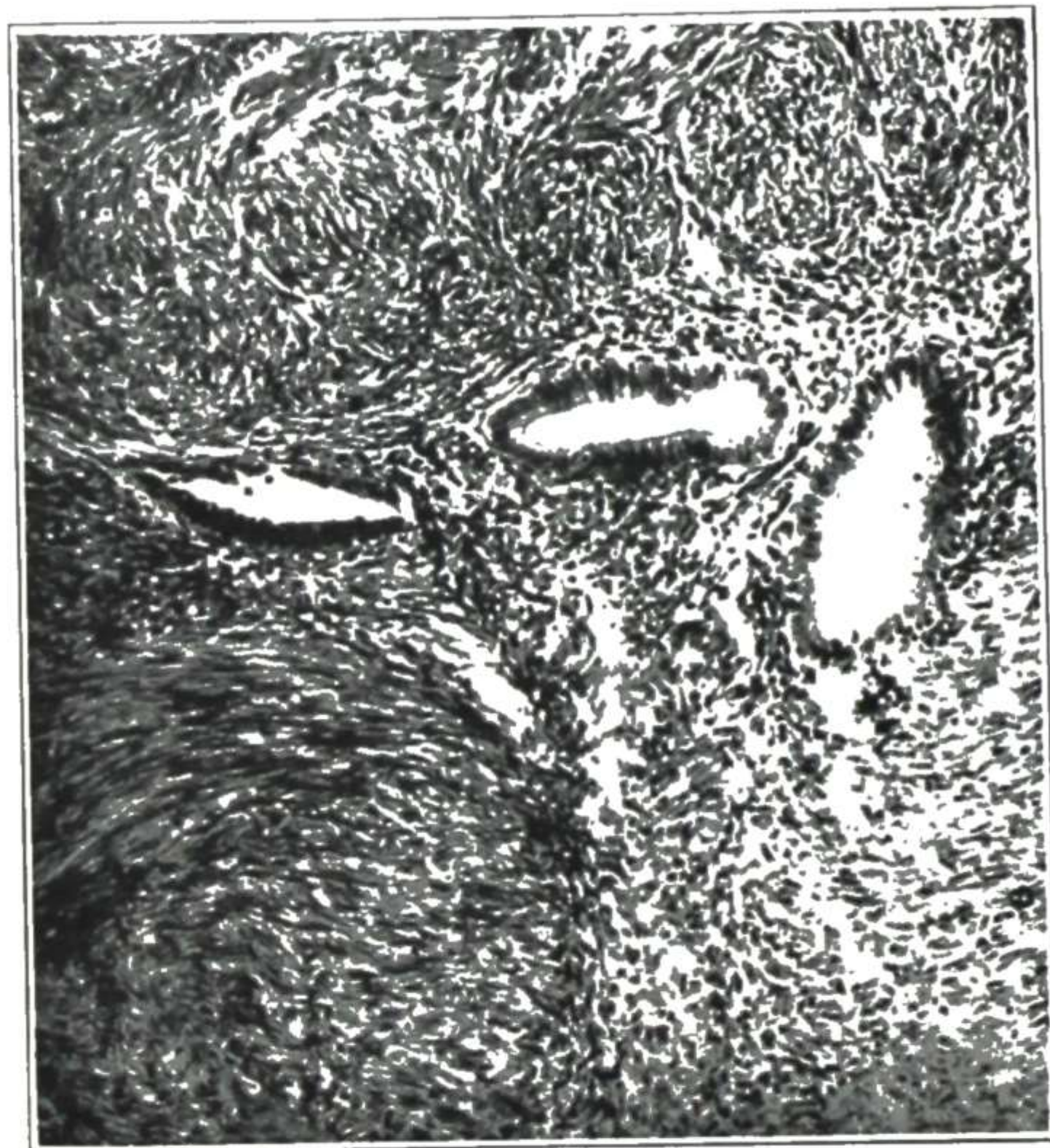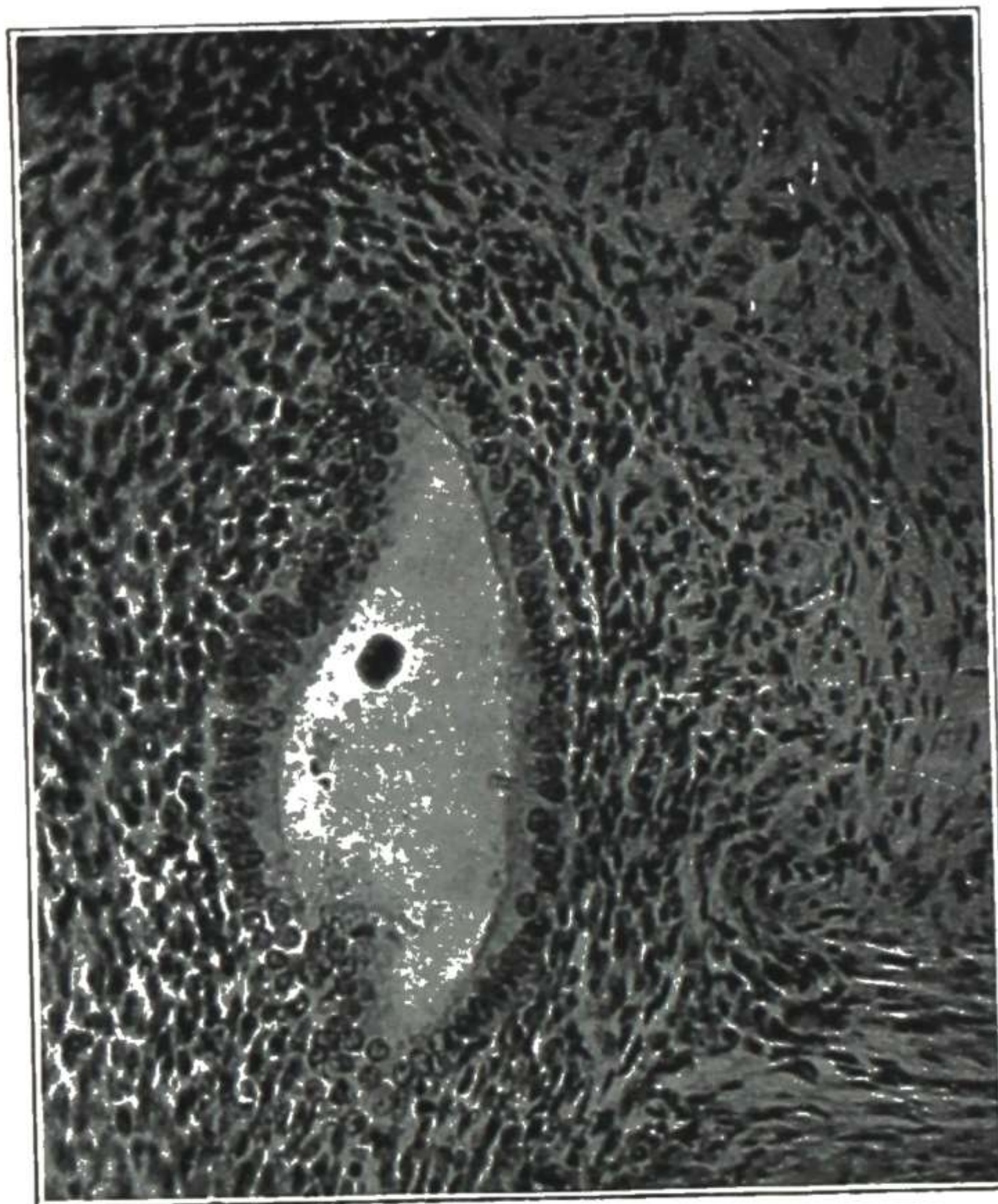

Fig. 635.

Fig. 636.

Fig. 635.—Showing typical glands in an adenomyoma. The specimen consisted of a very small subperitoneal myoma nodule, which was clipped off during the course of an abdominal operation without disturbing the uterus.

Fig. 636.—Higher magnification of a gland from the adenomyoma, showing the surrounding area of endometrial stroma. Gyn. Lab.
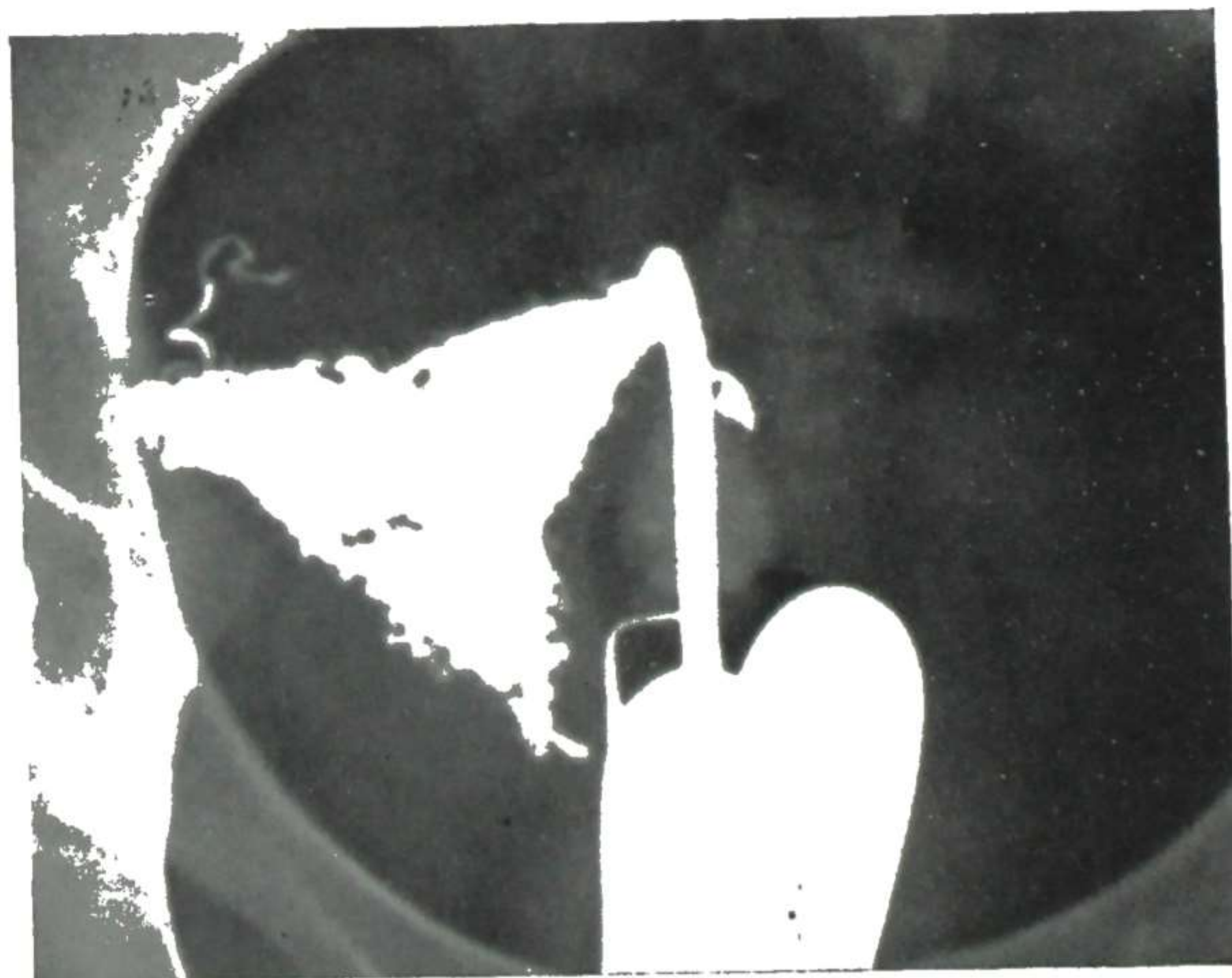

Fig. 637.—The uterine cavity is slightly enlarged, dextroverted. There are several small filling defects within the uterine cavity and tiny sacs extending from the border of the uterine cavity. *Impression*: adenomyosis. (From Goldberger, Marshak, and Hermel: Am. J. Obst. & Gynec., March, 1949.)

The symptoms are usually caused by the conditions associated with the adenomyosis rather than by the lesion itself. In the series reported by Spatt, 56 per cent had metromenorrhagia and 26 per cent had dysmenorrhea. Ste-

rility, though common in some series, was infrequent in the series reported by Hunter et al. who state that multiple pregnancies were frequent and nulliparas few.

The diagnosis in the early cases or in those with minimal involvement is rarely possible before operation, but with extensive adenomyosis the finding of a symetrically enlarged firm uterus in a woman who has had a history of menstrual abnormalities, especially bleeding and dysmenorrhea, makes the diagnosis fairly evident. Goldberger, Marshak, and Hermel found that in some cases hysterography could demonstrate the pits in the musculature made by the invading uterine glands; Fig. 637 is taken from their report.

Malignancy developing in adenomyoma is rare; we have had one case, and Grayzel reported a case in 1938.

MISCELLANEOUS GROWTHS

Nonmalignant tumors of the uterus other than myomas are rare. In 1922 Petersen reviewed the literature on mixed tumors of the uterus and collected only 31 cases, of which 28 per cent were malignant.

Fig. 638.

Fig. 639.

Fig. 638.—Photograph of opened uterus, posterior view. The fatty tumor of the fundus protrudes from the sectioned surface. The cornua are elongated. The mucosa is hemorrhagic and papillary.
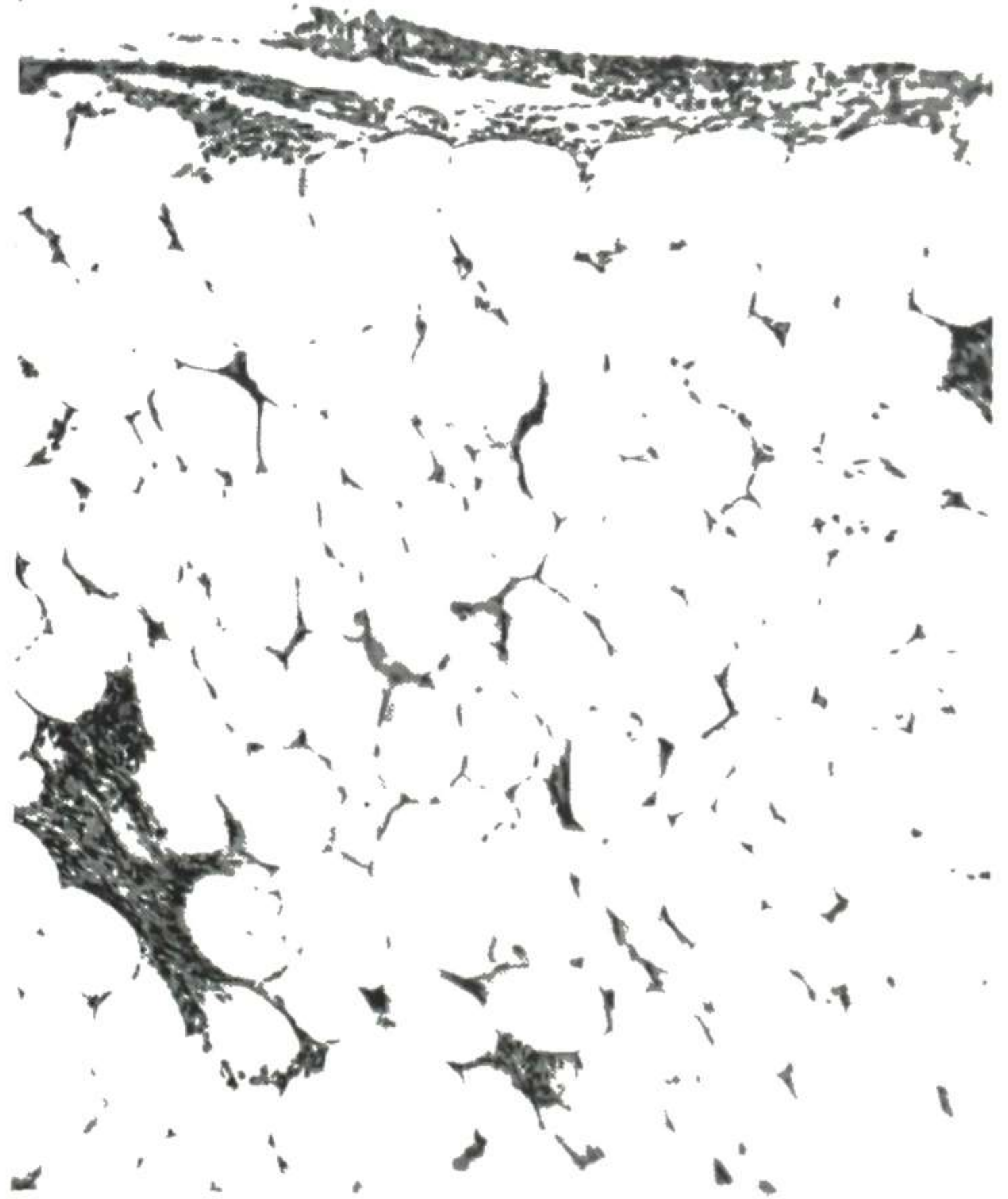
Fig. 639.—Photomicrograph of tumor in the fundus. The fibrous connective tissue capsule, trabeculae, and the adult type fat cells are shown.

(Courtesy D. P. Hall, University of Louisville; from Am. J. Surg., October, 1940.)

Simple lipoma was found in only 10 of the above series, but since that report there have been at least 15 additional cases reported. The histogenesis of these tumors is not definitely established. It is not certain whether they are true fat cells arising from lipoblasts or some of the normal cells present in the uterus which have undergone fatty infiltration or displaced embryonic mesoderm. Microscopic examination shows fat cells which stain typically.

These benign tumors are of little importance from a clinical standpoint, but they are usually diagnosed before operation as a soft fibroid or they may be mistaken for a pregnant uterus; Figs. 638 and 639 show a specimen of one removed by Hall and a similar case was recently reported by Decker.

Another rare group of tumors is that of the benign mesotheliomas, or adenomatoid tumors. This neoplasm may occur in the uterus, ovary, or fallopian tube in the female, or in the epididymis, spermatic cord, or testicular tunics in the male. Lee and his associates have recently reviewed the literature and reported 35 additional cases from the records of the Mayo Clinic, 12 of which were in the uterus.
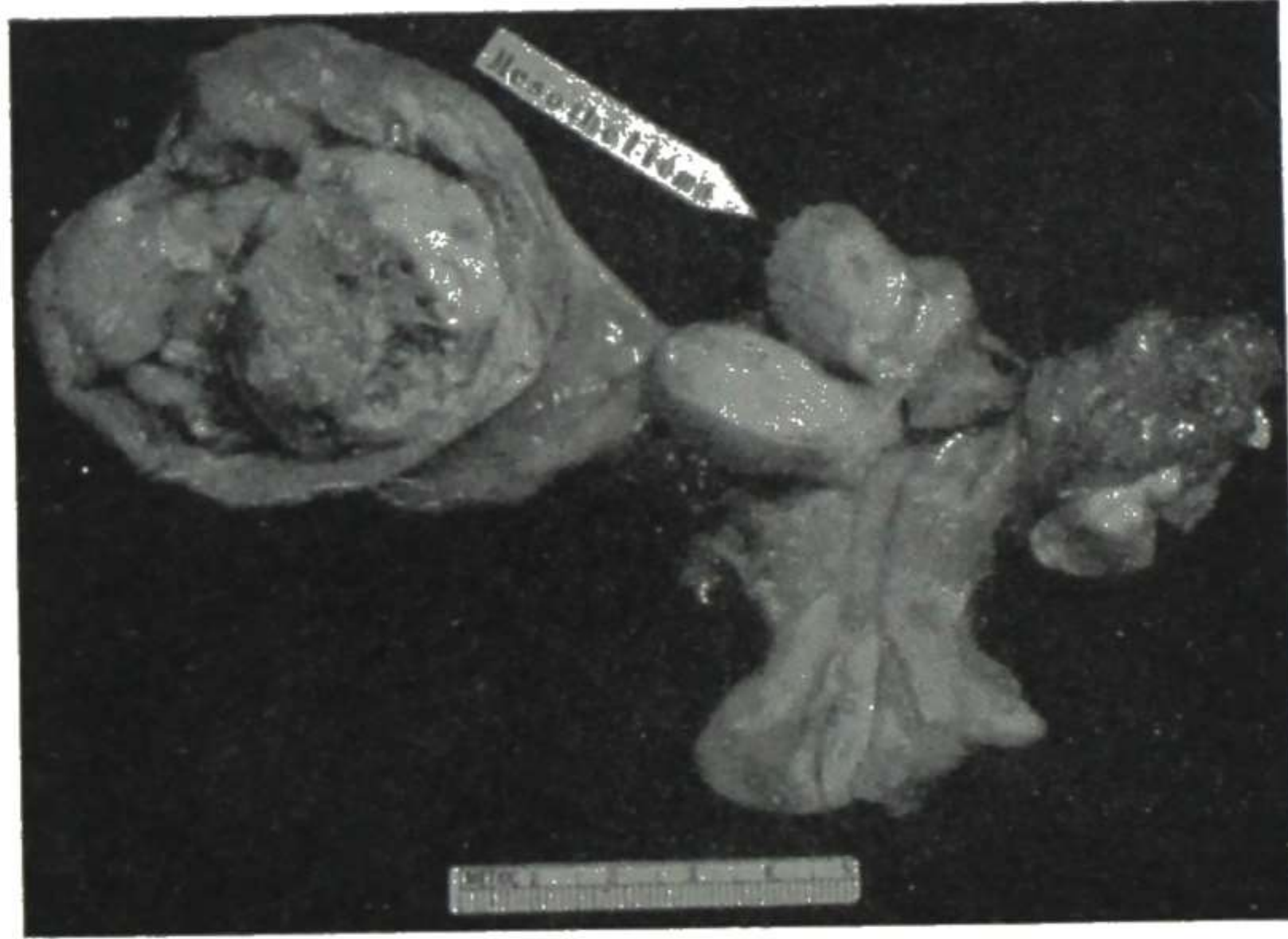

Fig. 640.—Mesothelioma of the uterus, showing the solid, trabeculated surface and slight bulging on cut section. Also depicted is a dermoid cyst of the right ovary which was associated with it. (From Lee et al., by permission of Surgery, Gynecology and Obstetrics.)
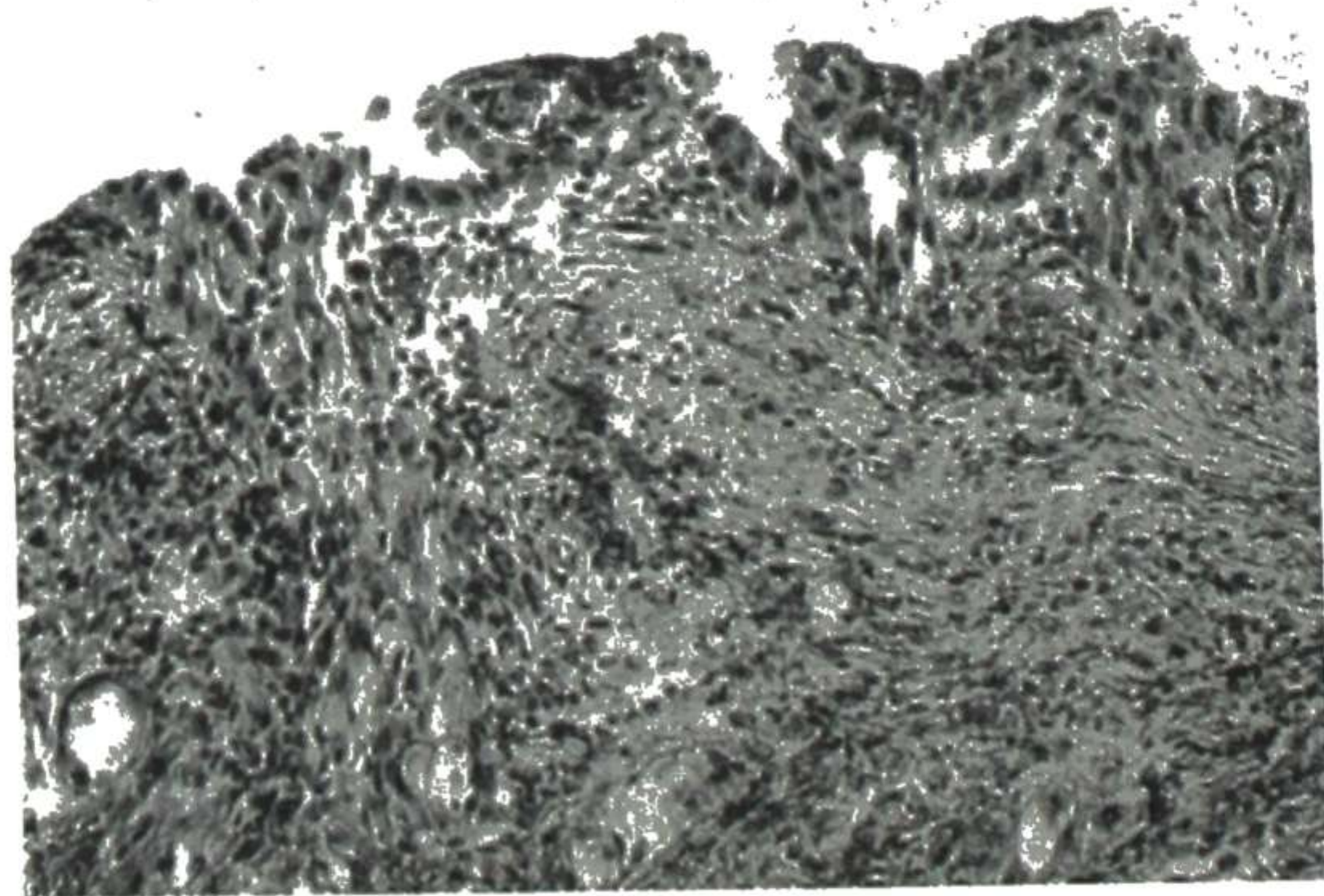

Fig. 641.—Mesothelioma of the uterus; note the direct relationship of the glandlike spaces with the serous membrane (hematoxylin and eosin, ×135). (From Lee et al., by permission of Surgery, Gynecology and Obstetrics.)

There are no typical signs or symptoms that characterize these tumors and even at operation they are usually thought to be simple myomas with degeneration. The gross pathologic features which differentiate them are the following: most of them are on the posterior surface of the uterus just beneath the peritoneum and they appear as a single circumscribed but not encapsulated, grayish-yellow, trabeculated tumor. Microscopically these tumors

are comprised of a loose network of hyalinized fibrous stroma with smooth muscle usually at the periphery of the tumor. Scattered through the stroma are numerous spaces and groups of cells which vary in type, shape, and size. The three general types are the canalicular, large spaces lined with flattened cells; the tubular, with spaces resembling glands, lined with cuboidal or low columnar cells; and the plexiform, consisting of solid strands of cuboidal epitheloid cells. In the uterus the plexiform type is rare. Fig. 640 shows a case in the Mayo Clinic report mentioned above; Fig. 641 shows the relationship of the glandlike spaces to the peritoneal surface of the uterus.

Bosaeus and Swanberg reported a case of glioma of the uterus which they state is the only uterine glioma reported in the literature.

BENIGN TUMORS OF THE CERVIX

Myomas of the cervix have been discussed previously. In addition to these, there are several rare types of benign tumors which should be mentioned; these are tumors from the cervical portion of the mesonephric or Gartner's duct and endometriosis of the cervix.
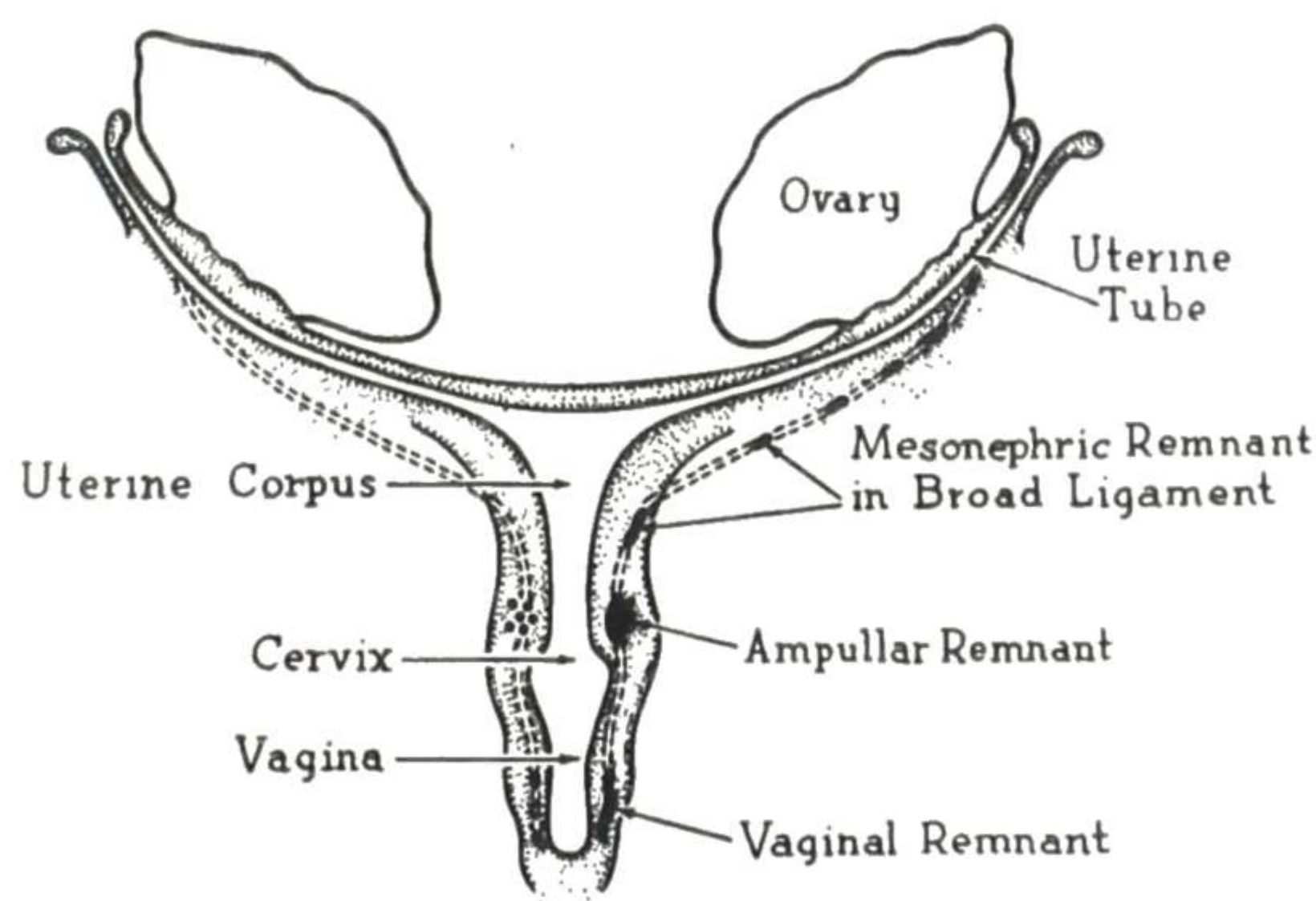

Fig. 642.—Diagram. Degeneration of the mesonephric duct begins during the later stages of fetal development. This degeneration may be complete or remnants may be left in the vaginal wall, the cervix, the uterine wall, or the broad ligament or near the ovary. (From Huffman: Am. J. Obst. & Gynec., July, 1948.)

R. Meyer clarified the question of the origin of these tumors and established their source from embryonic remnants of the mesonephric duct. Wolfe reported a case and states that his was the only one found in 1,413 cervices examined. He felt that the reason for the infrequent occurrence is the fact that the cervical tissue removed in the usual cervical operations is below the level of the internal os where most of the Gartner duct rests are found and the fact that the pathologist rarely takes a complete transverse section of the lower end of a uterus removed by supravaginal hysterectomy. Fig. 642, taken from Huffman's article, shows the position of the ampullar remnants. Huffman found five instances of mesonephric remnants in serially sectioned tissue from 1,192 surgically excised specimens; Fig. 643, taken from his article, shows a cleftlike remnant in a longitudinal section of the cervix. He points out that these tumors are of three types: cysts, adenomatous proliferations of varying degrees, and adenocarcinomas; his article contains excellent microscopic photomicrographs of each type. The clinical picture is shown in Fig. 644 from a case reported by Kotz.

Fig. 643.—A longitudinal section through a cervix to show a mesonephric remnant in the mid-cervical wall. In this instance there is a persistence of a narrow cleftlike large tubule which is surrounded by numerous small canaliculi. (From Huffman: Am. J. Obst. & Gynec., July, 1948.)

Fig. 644.—Gross appearance of Gartner's duct cyst, anterior view. (From Kotz: Am. J. Obst. & Gynec., December, 1935.)

Endometriosis of the cervix is an unusual lesion; one was reported by Hobbs and we have had one case. In our case the distended glands ruptured to the surface and bled with each period; conization of the cervix cured this patient. The chief importance of the lesion is to differentiate it from carcinoma.

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Chapter 8
CANCER OF THE UTERUS

According to the vital statistics for the United States for 1947, cancer of the uterus was responsible for 18.1 per cent of all female deaths from cancer. During that year 17,455 women died of uterine cancer. Eleanor J. Macdonald, Research Statistician of the Cancer Division of the Connecticut State Department of Health, estimated that, in 1950, physicians in the United States would see 17,066 new cases of cancer by speculum examination. In 1946 uterine cancer was responsible for 14.5 per cent of cancer deaths in the female population, the figure being identical to that of deaths from breast cancer; hence, these two share the sinister distinction of leading in the cancer deaths in women. Kamperman found cancer of the uterus in 4 per cent of all gynecologic cases. In an analysis of 2,832 malignancies of the female pelvis seen at the University Hospital of the University of Michigan, Norman F. Miller found that 81 per cent were uterine.

ETIOLOGY OF CANCER

The underlying cause of cancer is still a mystery, but through the combined efforts of geneticists, chemists, biologists, bacteriologists, pathologists, and clinicians new facts concerning normal and abnormal growth are being discovered.

In experimental animals it has been amply shown that certain strains are resistant to the development of specific types of carcinoma while other strains will almost invariably develop it. Geneticists have been able to produce mutations and cancer by using various carcinogenic agents. Certain types of cancer in man, such as retinoblastoma, are known to be inherited, while others which are potentially malignant, such as multiple polyposis, are thought to be inherited. Certain families in which there is a high concentration of certain types of neoplasms will tend to have a higher incidence of this particular cancer than is found in the population as a whole. Wassink found this to be true of mothers and sisters of patients with breast cancer. Macklin, in a statistical study, found that "male relatives of breast cancer patients who have cancer appear to have prostatic cancer in greater percentage than do male relatives with cancer who are related to patients with cancer elsewhere than in the breast." These findings certainly do not indicate that every member of a cancer family will develop cancer but should cause such individuals to have regular checkup examinations so that early deviations from normal may be discovered. Murphy, in his study, *Heredity in Uterine Cancer,* concluded that though heredity is an important factor in the development of uterine cancer, the incidence of breast cancer was not linked to the incidence of uterine cancer.