

metritis posterior, and it is frequently overlooked in a pelvic examination. Another genital lesion that nearly always causes backache is prolapse of the uterus with cystocele and rectocele.

### **Backache From Extragenital Conditions**

Backache from extragenital disease is of very frequent occurrence and must be given due consideration when determining the diagnostic significance of this common symptom.

## **SPECIAL EXAMINATIONS**

It is not necessary to take space for details of all the examinations required in regard to probable or possible conditions or complications in gynecologic patients. Perusal of the list near the beginning of Physical Examination will direct attention to the possibilities in various directions and the necessity of following them up—either personally or through consultations. The importance of this is emphasized by the growing demonstration that the body functions as a unit in physiological and pathological activities and consequently that the whole must be considered when trying to determine the cause of special action in a part. By keeping this in mind many serious diagnostic mistakes will be avoided, such as the employment of radical gastric and dietetic measures for persistent nausea and vomiting without determining if the patient is pregnant, or the employment of pelvic operation for severe pelvic distress that is only a psychic fixation. Space is available here only for those special examination measures particularly related to the genital organs. They are taken up in the following order:

Through the Speculum. (Vaginal smears and surface biopsy, colposcopic examination, Schiller test, cervical biopsy, endometrial biopsy, cul-de-sac puncture with aspiration.)

Pregnancy Tests.

Endocrine Examination.

Tubal Patency Tests (Rubin).

X-ray Examinations. (Hystero-gram to outline uterine cavity; hysterosalpingogram for cavity and tubes; gynecography as additional aid in obscure cases. For fetal bone shadows, calcified tumors, stones, metastatic bone lesions, bony deposits in a skull, and size and shape of sella turcica.)

Pelvic Examination under Anesthesia. (Curettage, biopsy, conization.)

Intra-abdominal Inspection. (Culdoscopy, peritoneoscopy, incision.)

Urinary Tract Investigation.

Premarital Examination and Advice.

## **VAGINAL SMEARS AND SURFACE BIOPSY**

In 1928 Papanicolaou suggested the use of the vaginal smear as aid in the diagnosis of early genital cancer in women. In 1943 he reported a special method of staining vaginal smears, which stained the cytoplasm and nucleus clearly and gave clear differentiation between basophilic and acidophilic cells. Until the last ten years there was little acceptance of the method clinically in

the diagnosis of cancer but it did come into general use as an aid in diagnosing disturbances of ovarian function. It is now well established as an integral part of gynecologic diagnostic procedure.

As an assay of endocrine function the vaginal smear is used to detect normal or abnormal ovarian function, ovulation, pregnancy, threatened and incomplete abortion.

The literature on its use in the cytologic diagnosis of uterine cancer is voluminous, and it is now being used in the diagnosis of ovarian, tubal, and vulvar cancer as well as a method of cancer diagnosis in other fields of medicine. In this chapter the technique and relative accuracy of the test and its evaluation as a routine procedure will be included.

### Preparation of Vaginal Smears

Papanicolaou and Traut give the following technique:

“A slightly curved glass pipette, six inches in length, 0.5 cm. in diameter, with rounded tip and a small opening, and equipped with a strong rubber bulb for producing suction is used. The patient is placed upon an examining table in the lithotomy position. No lubricating jelly is used nor is speculum introduced. The labia are separated and the rubber bulb compressed. The pressure on the bulb is then released and the suction produced serves to aspirate vaginal fluid with its cellular content into the glass tube. While aspiration is in progress, the tip of the tube is moved from one side of the fornix to the other so that all parts are sampled. The pipette is then withdrawn, and the vaginal material is spread upon the surface of a clean microscope slide with a sudden expulsive pressure on the bulb. Further spreading with the convex side of the pipette is advisable when the amount of fluid is abundant, as in cases where there is considerable bleeding or abundant mucus. Very thick smears are not well penetrated by the fixing fluids and cannot be uniformly stained.

“The slides are immediately plunged into a solution of equal parts of 95% alcohol and ether. Drying of the smears should be carefully avoided as it results in the loss of the sharp outlines of the cells, and in a change in their staining reaction. The fixation does not require more than a few minutes, but smears may be kept in the alcohol-ether solution over a long period of time. It is recommended that the slides not be kept in the fixative for more than a week or two as the cells slowly tend to lose their normal staining reaction. If ether is not available, plain alcohol (95%) can be used. For shipping slides, a square bottle  $1\frac{3}{4}$  by  $1\frac{3}{4}$  by  $4\frac{1}{2}$  inches may be used. Such a bottle may hold as many as seven or eight slides. An ordinary paper clip attached to each or every other one of the slides prevents the smears from rubbing against one another.

“A few precautions should be observed in the procurement of material for the vaginal smear. The vaginal contents should not have been disturbed by any form of examination or treatment. Douching or bathing will, of course, dilute or completely wash away the cellular deposits for a period of several hours. If there is a considerable amount of fluid of either serosal or sanguineous character, dilution will occur, in which case it is wise to make several smears to obtain the representative cell constituents which are ordinarily seen in a single smear.”

This method of preparation of vaginal smears is very simple. It was so designed originally in order to permit repeated sampling without any discomfort to the patient. No instruments except the pipette are necessary. An intelligent woman can easily be taught to prepare her own smears when a larger number of them is required for study. Women are supplied with the necessary slides, with bottles containing equal parts of alcohol and ether, and with a sterilized pipette. The name and number of the patient and the dates when the smears should be taken are preferably marked in advance on the slides with a diamond pencil. When daily smears are required, the patient is ad-

vised to take one every morning before a bath. Every woman who is asked to prepare her own smears is supplied with a typewritten sheet containing some practical instructions. These are as follows:

1. Smears should not be taken after a douche or bath.
2. Wipe off slides with a clean cloth and have slides and solution ready before starting. Attach a paper clip to the end of each slide to separate the slides in solution and prevent the smears from touching each other.
3. First, press the bulb and then insert the pipette into the vagina about 3 to 4 inches. Release the bulb and leave the pipette in the vagina about  $\frac{1}{2}$  minute, moving it around cautiously. Remove the pipette slowly.
4. Blow the secretion on the slide with a sudden squeeze of the bulb and smear it with the curved end of the pipette in order to secure an even distribution.

In some cases after obtaining the smear as outlined above, a dry speculum is inserted and a sample of secretion is obtained by inserting the pipette a short way into the cervical canal in order to get a specimen from the uterus itself.

Total uterine sampling was suggested by Doyle, and the Lucite spoon is used to collect the specimen. The spoon is worn from twelve to twenty-four hours at the menstrual time, then the tissue obtained is washed from the spoon with saline and the curettings are placed in formalin. Doyle states that frequently the amount of tissue obtained is greater than that obtained by curetting. He suggests a sampling twice a year in women over thirty-five years of age.

### **Surface Biopsy**

The surface biopsy is a procedure by which the superficial layer of the cervical epithelial cells is removed by gentle scraping.

Ayre uses a special wooden spatula. Novak uses a spoon-shaped instrument with a sharp edge. Myller devised a small metal cone with blunt rectangular fins on two sides. Gladstone rubs the cervical surface firmly with a small piece of Gelfoam. With the first three of these methods the material may be used either as a Papanicolaou smear or it can be put in formalin for paraffin section and hemotoxylin eosin staining; only the latter type of preparation can be used with the Gelfoam technique.

All workers in the field are in agreement on the point that all positive smears should be confirmed by microscopic examination of tissue removed from the cervix either by biopsy or conization, before treatment is instituted.

In a compilation of reports from the literature, Gusberg and Graham concluded that the accuracy of the test is about 90 per cent with properly trained personnel and correct taking and staining of the slides. Ruth Graham, in screening 1,070 patients, found unsuspected cancer in 0.9 per cent.

A critical analysis of the importance of utilizing these newer methods of diagnosis in order to increase the incidence of early lesions discovered, was made by Douglas and Studdiford. For more detailed discussion of this subject see the chapter on Cancer of the Uterus.

### **COLPOSCOPIC MAGNIFICATION**

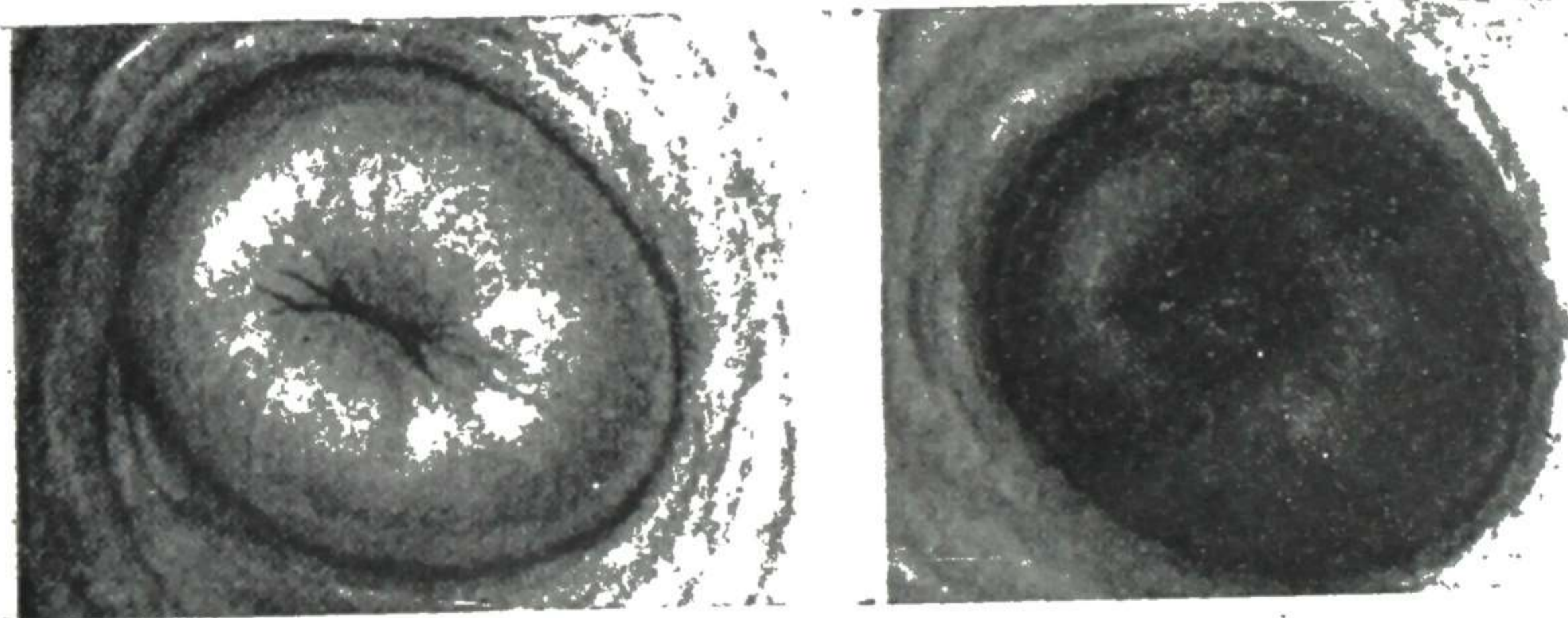
By means of the colposcope a magnified view of areas of the cervical and vaginal surfaces are obtained through a system of magnifying lenses used in connection with the speculum examination. The magnification is five to ten

times, and it brings out the minutiae of a pathological area in a striking way. Less expensive colposcopic instruments are now made as part of the popular lighted endoscopic diagnostic sets. Such a magnifying lens-tube attached to a speculum is a convenient form.

This diagnostic instrument for magnifying early pathologic changes on the surface of the cervix is very helpful in certain lines of investigation, particularly in studying the early changes in cancer and other lesions. It is not necessary, however, to have expensive instruments in order to make the important clinical decisions that must be made in these cases of pathologic cervix. The important thing is to remove promptly any chronically irritated area, while it is still a simple process. Do not procrastinate by watching such an area, with or without special instruments, for the first sign of cancer. Remove it before the cancer develops.

### SCHILLER TEST

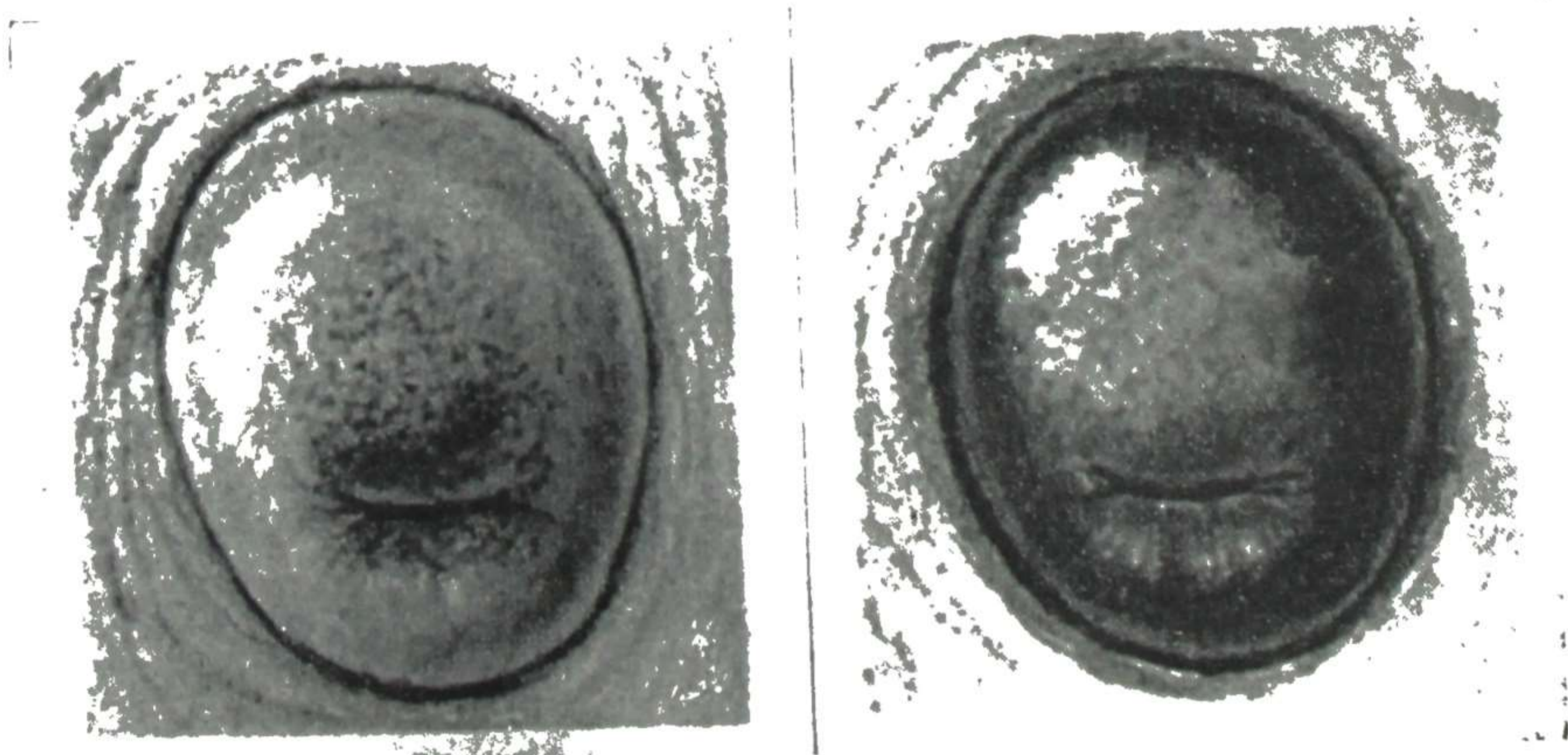
The chemical test, called also the Schiller test, depends on the fact that the normal squamous epithelial cells of the vagina contain glycogen and hence



A.

B.

Fig. 210.—Lahm-Schiller test on a normal cervix. A, Before use; B, after iodine solution has been applied. (From Henriksen: Surg., Gynec. & Obst.)



A.

B.

Fig. 211.—Lahm-Schiller test on an abnormal cervix. A, Before use; B, after iodine solution has been applied. Note that the areas of eversion and erosion are not stained. (From Henriksen: Surg., Gynec. & Obst.)

stain brown when iodine is applied. The cervix and adjacent mucosa are painted with Gram's iodine solution (iodine 1 part, potassium iodide 2 parts, water 300 parts), which causes the normal squamous epithelium to stain a uniform brown color. Areas of eversion, erosion, cervicitis, cancer, and other pathologic conditions do not stain, and hence become more noticeable by contrast (Figs. 210 and 211).

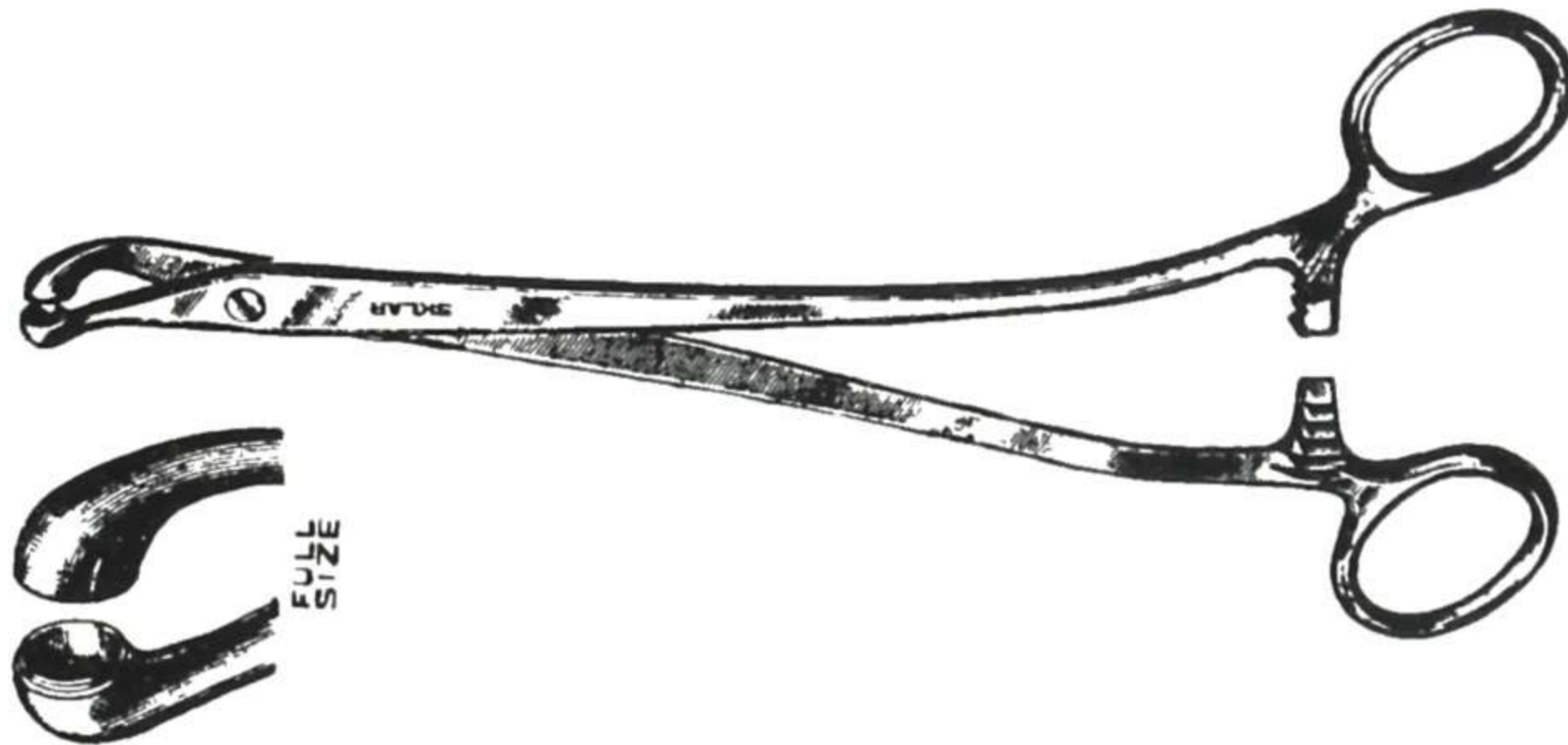


Fig. 212.—Modified Gayler specimen forceps. (From Thoms: *Am. J. Obst. & Gynec.*, January, 1950.)

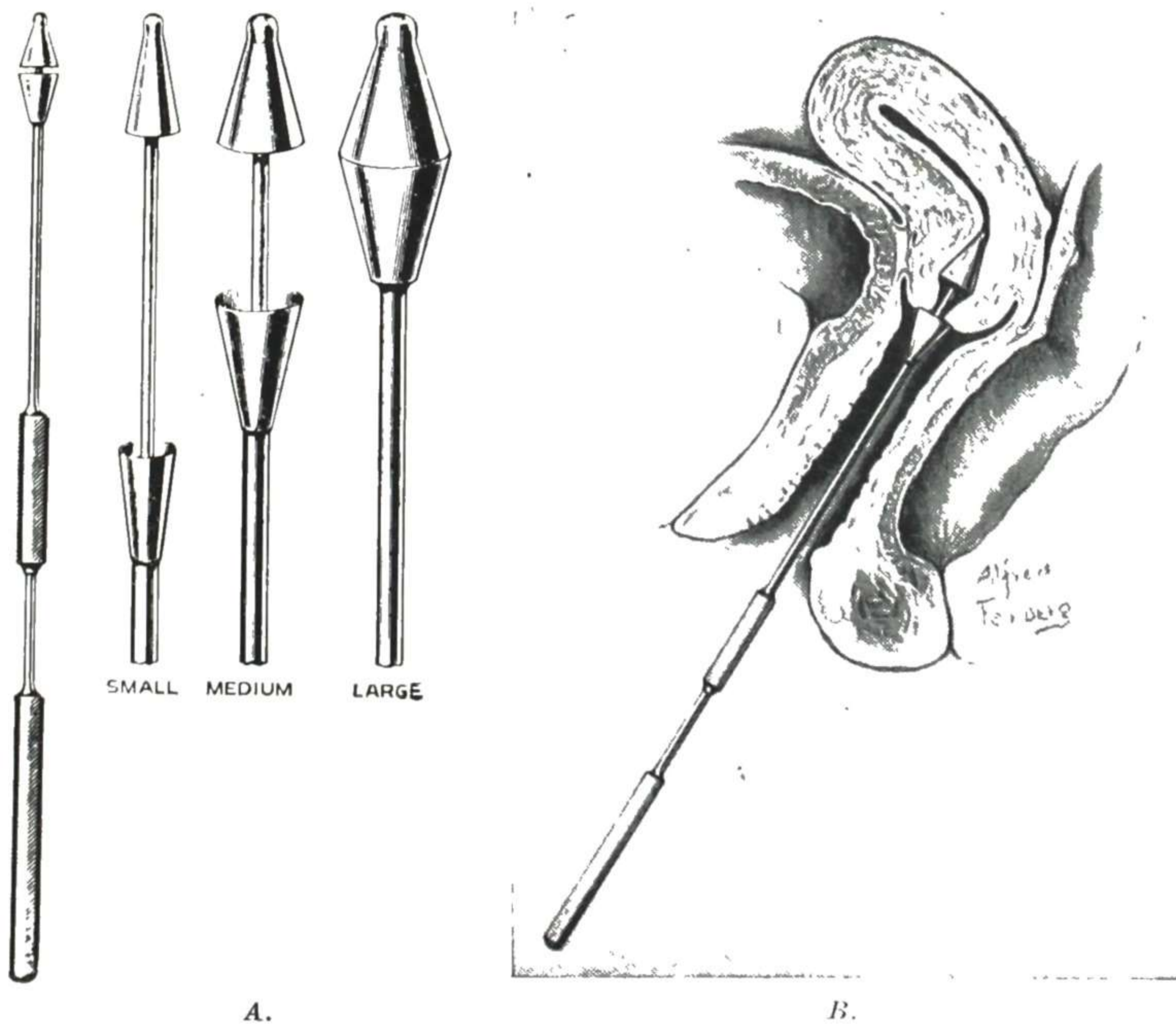


Fig. 213.—A, Endocervical biopsy curettes. Note open and closed positions of cutting cups. B, Curette in cervical canal. The coning biopsy will remove the squamous-columnar junction region at the histologic external os. (From Gusberg: *Am. J. Obst. & Gynec.*, February, 1951.)

Interesting in this connection is the fact, mentioned in Chapter 1 (Anatomy and Physiology), that this glycogen storage in the vaginal epithelium seems to depend on the sex hormones and is ordinarily absent in childhood up to puberty and also after the menopause. During the first few days after birth the cells show glycogen storage, presumably due to the sex hormones supplied to the child by the mother.

### CERVICAL BIOPSY

In cases of chronic cervicitis, a conization, small or wide depending upon the extent of the involvement, is preferable to biopsy, because with this procedure you have rid the patient of her troublesome lesion and, also, all of the tissue is removed for microscopic examination.

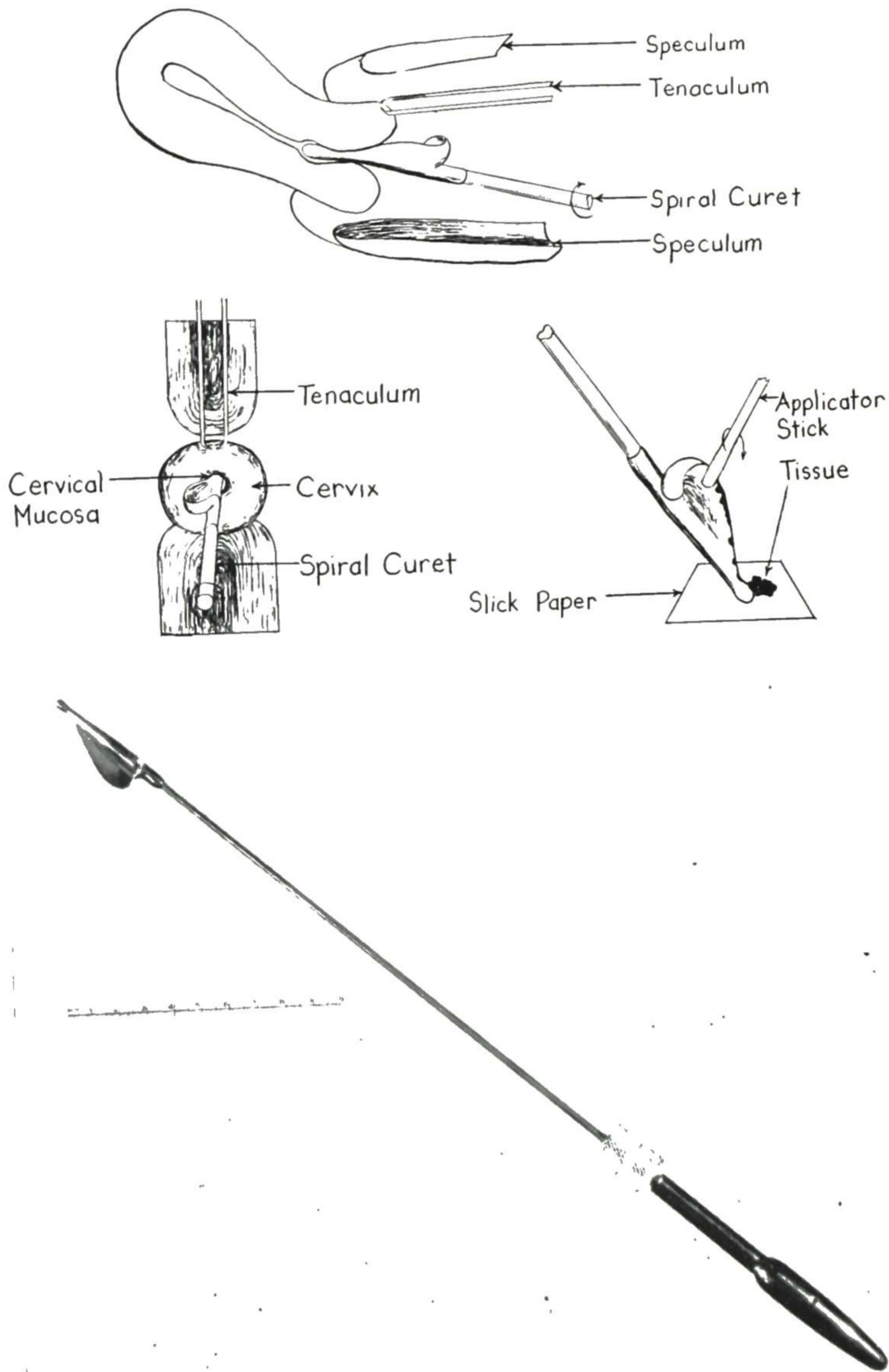


Fig. 214.—Cervical biopsy curette (Nolan-Budd). (From Nolan and Budd: *Cancer*, November, 1951.)

When the cervix is normal except for a small suspicious area or, as it is called, "target lesion," a biopsy should be obtained. One should, however, be cognizant of the limitations of this procedure and realize that a carcinoma

may be starting in an area of the cervix other than where the particular bit of tissue was obtained. There are numerous articles in the literature on the importance of taking multiple biopsies, but it seems to me that in cases of this type conization is preferable.

There are numerous instruments on the market designed for cervical biopsy; the Gayler is probably the one most frequently used. A modification of this instrument suggested by Thoms has improved the cutting edge by having it telescoped into the cup of its companion blade (Fig. 212). This shearing action enables one to remove the specimen without having to twist it off. Other instruments for cervical biopsy are shown in Figs. 213 and 214.

### EXPLORATION OF ENDOMETRIAL CAVITY

Invasion of the uterine cavity with sound or curette requires careful asepsis. It carries some risk and should be employed only for some special purpose warranting the risk.

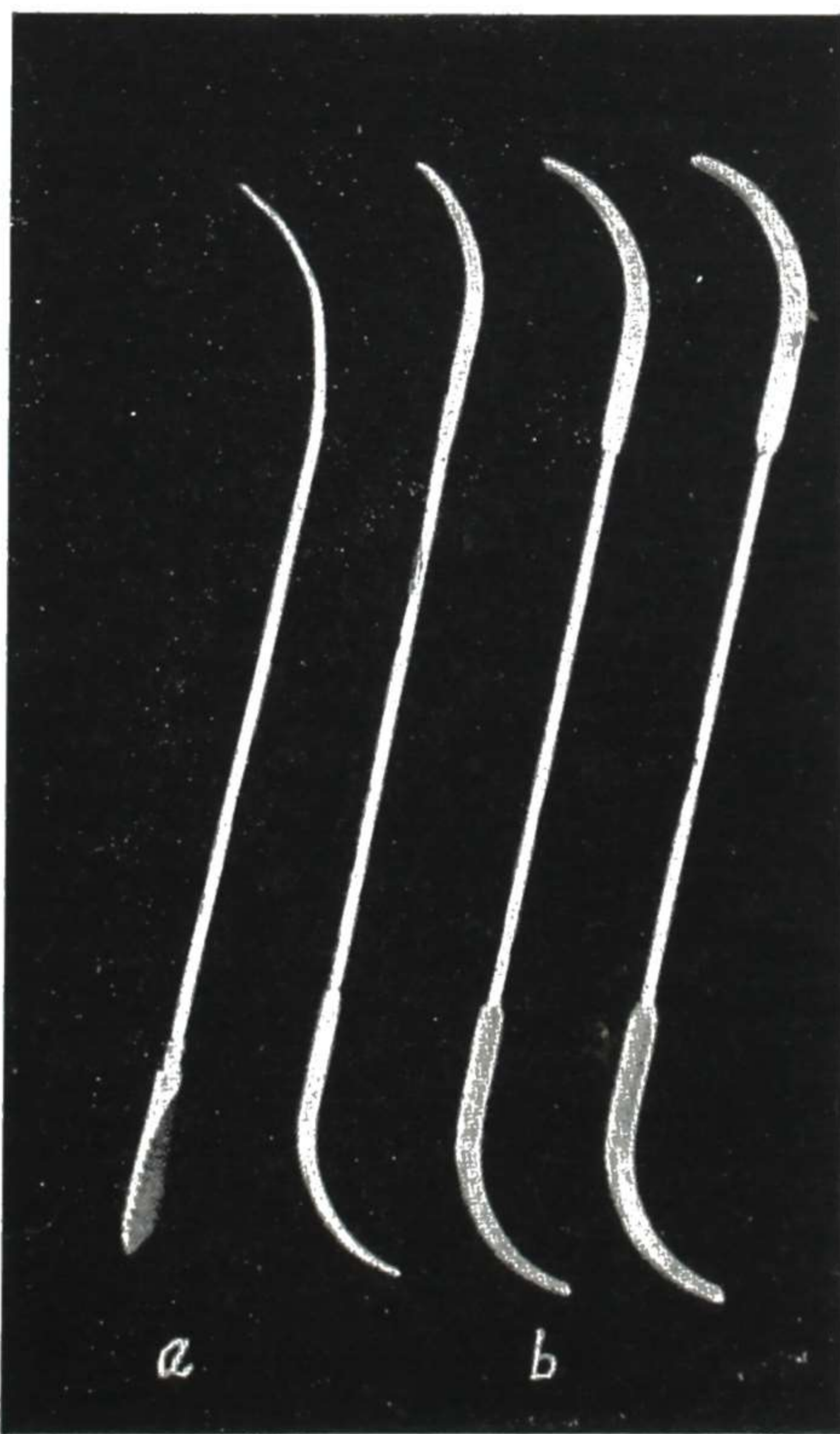


Fig. 215.—Instruments for dilating cervix. *a*, Uterine sound; *b*, three graduated metal dilators for enlarging the cervical canal.

Dilatation of the cervical canal as a diagnostic and therapeutic measure for stenosis is not infrequently required. Instruments for office dilatation are shown in Fig. 215. When there is bleeding or discharge indicating some disease of the endometrium, regular curettage in the hospital under operative preparation and asepsis is the advisable diagnostic and therapeutic measure (see Examination Under Anesthesia).

**Endometrial Biopsy**

The physiological studies given show that the condition of the endometrium is an index as to ovarian activity. By means of minute specimens of the endometrium, secured in the office at certain periods of the menstrual cycle, information may be gained as to ovulation and also as to the effects of endocrine treatment. Several types of small curettes for this purpose have been devised. Some are used with suction, like Novak's, and some without suction, like that devised by Meigs (Fig. 216). The latter is very small, which reduces the discomfort of the procedure; a hystrometer is also shown.

With the vaginal speculum in place, a suitable antiseptic is applied to the cervix and the cervical canal; the sterile curette is introduced to the fundus and then drawn gently but firmly along the wall to obtain the endometrial specimen. The specimen is immediately placed in the small bottle of 10 per cent formol.

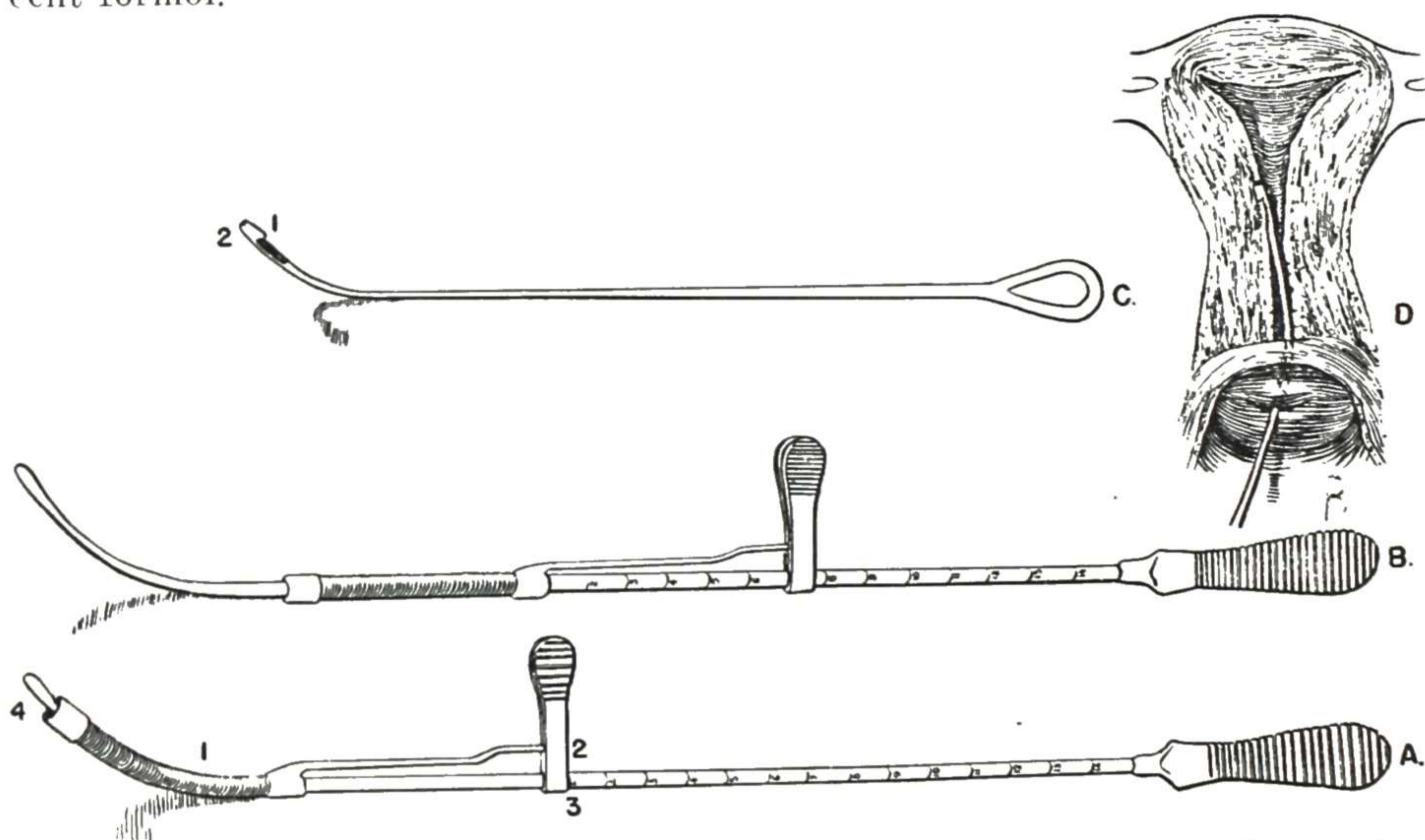


Fig. 216.—A, Hystrometer. 1, Coiled spring so that curve of sound may be passed; 2, spring clip which is used as handle to move measuring part of apparatus and to hold it steady on shaft; 3, area of measurement. Note that it registers 1 cm. and that there is 1 cm. at 4. B, Hystrometer measuring cupped curette. 1, Sharp overhang to curette; 2, small hole in cup to allow escape of secretions. D, Curette removing tissue from endometrium. Curette can be used numerous times to obtain tissue from different regions but a piece from either side is usually sufficient. (From Meigs: *Am. J. Obst. & Gynec.*)

After the usual laboratory preparation, examination of the specimen shows whether the endometrium is that of an ovulatory or nonovulatory cycle, which information is important in the diagnosis and treatment of sterility and other functional ovarian and uterine disturbances. Also, the effectiveness of endocrine medication may be checked on by information thus gained. The day before or the first day of menstruation is the best day for biopsy.

Special endoscopes have been devised from time to time for the purpose of visual exploration of the endometrial cavity. However, the imperfect vision secured because of the difficulty in distending the cavity and the dangers of manipulation within the uterine cavity and the more decisive information furnished by curettage militate against uteroscopy.



### CUL-DE-SAC PUNCTURE

Cul-de-sac puncture or culdocentesis, as it has been designated by Beacham, is done in order to aspirate fluid from the cul-de-sac of Douglas for diagnostic purposes. Dan W. and W. D. Beacham report a series of over 500 cases in which aspiration of the cul-de-sac was performed; 85 per cent of these were done in examining rooms either in the clinic or the hospital.

The technique given in this article is as follows:

“The patient is placed in the usual lithotomy position of abdominopelvic examination [Fig. 217]. After palpation, the speculum is inserted so as to expose the cervix and posterior vaginal fornix. The posterior lip of the cervix is grasped and elevated with the volsellum or tenaculum (for some patients this is not necessary). The posterior fornix is sponged dry and an antiseptic solution, commonly tincture of Merthiolate, is applied. The needle is thrust into the center of the cul-de-sac or into the previously felt mass therein.

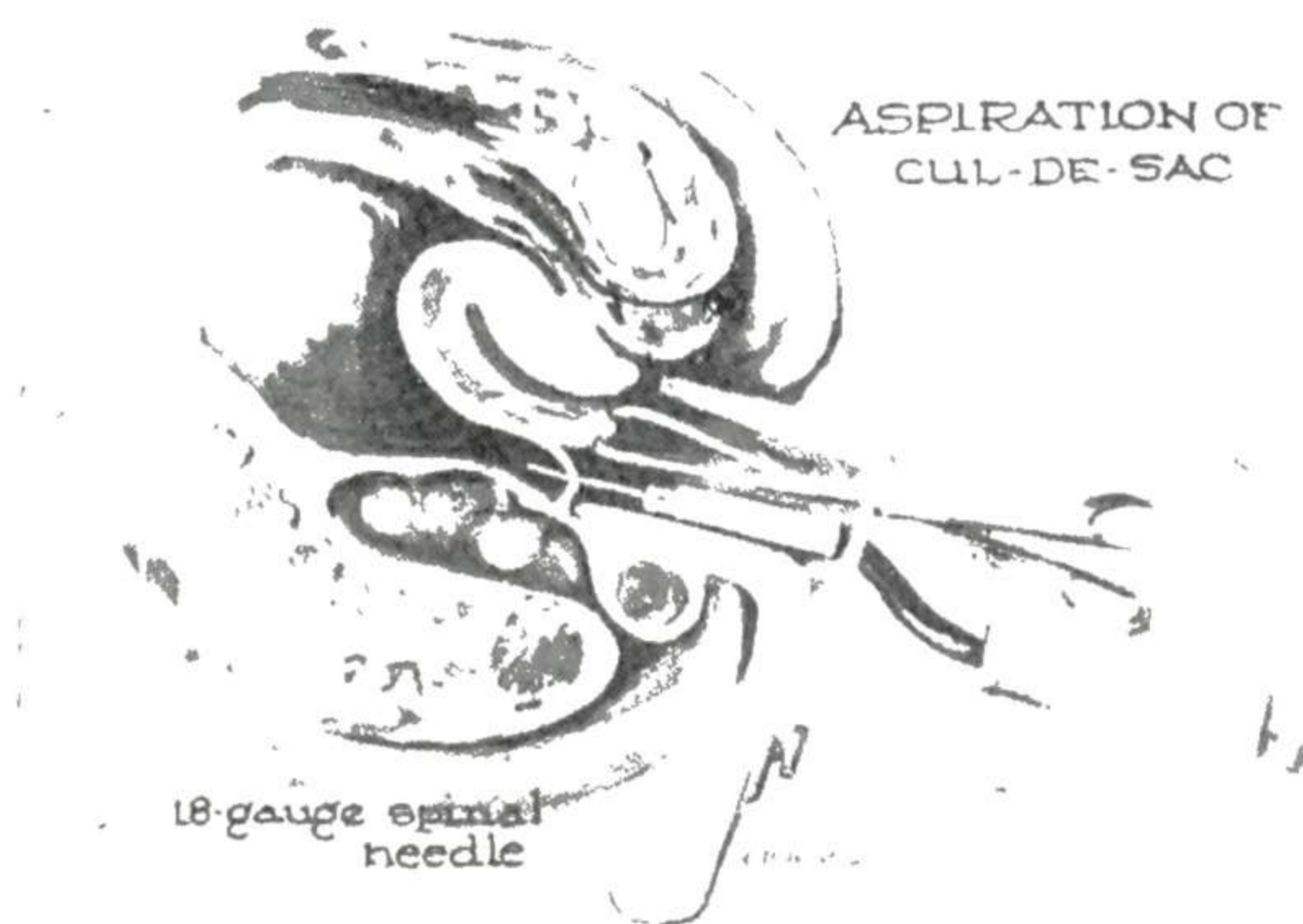


Fig. 217.—The instruments most commonly employed are: a bivalve vaginal speculum, 18 gauge spinal needle, glass adapter with tubing, and an aspirating syringe. Often a 5 or 10 c.c. syringe has been substituted for the adapter, tubing, and larger syringe. The instruments and gloves utilized have been sterile and dry. (From Beacham and Beacham: *New Orleans M. & S. J.*, January, 1951.)

The direction of introduction is as nearly parallel to the body of the uterus as is practical. The depth of insertion has rarely exceeded 2 centimeters. Suction is applied with the syringe. If no fluid is obtained, the suction is maintained as the needle is slowly withdrawn. The needle end may have been occluded at the depth of the insertion and may ‘find’ the fluid as it is withdrawn. In order to decrease the likelihood of laceration of blood vessels or intestines the end of the needle should not be made to wander. Usually the needle should be completely withdrawn in one minute, lest intravascular blood be aspirated and allowed to clot in the needle or syringe. If blood from a vein or artery is aspirated, or if feces is aspirated, another aspirating set is used for the repeat aspiration. If nothing is obtained on the first attempt, the needle is reinserted with a change of direction and/or position. As a general rule, not more than three insertions have been performed at one examination. If the anticipated results are not found, after a period of several hours the aspirations may be attempted again. The fluid obtained should be examined immediately. No special after care . . . is needed.’’

If no fluid is obtained, it usually means that the cul-de-sac has not been entered, for there is usually enough peritoneal fluid to furnish one or two drops of clear fluid. If pus is obtained, it is cultured. Any blood obtained is observed for at least six minutes, and if it does not clot and there is no

blood dyscrasia present, it is assumed that the blood was obtained from the peritoneal cavity. The accompanying table shows an analysis of 174 cases in which laparotomy was performed after finding blood on culdocentesis.

CULDOCENTESES PERFORMED AT CHARITY HOSPITAL OF LOUISIANA AT NEW ORLEANS

(JAN. 1, 1947, TO FEB. 1, 1950)

BLOOD ASPIRATED—LAPAROTOMY PERFORMED

DIAGNOSES	CASES	DIAGNOSES	CASES
Ectopic pregnancy	174	Ruptured broad ligament cyst	1
Ruptured "simple" ovarian cyst	3	Volvulus of sigmoid	1
Ruptured graafian follicle	2	Volvulus of ileum	1
Ruptured corpus luteum	1	Ruptured spleen	1
Endometriosis	1	Metastatic carcinoma of liver, intestine, etc.	1
Granulosa cell tumor	1	Puncture wound of cul-de-sac	1
Uterine myoma with degeneration	1	Intravascular aspiration (misinterpreted)	5

This excellent report should certainly lead to a wider use of this valuable adjunct to our diagnostic armamentarium.

### PREGNANCY TESTS

When the diagnosis of pregnancy is not clear from the physical examination signs, there are two courses to follow in obtaining additional diagnostic information. When there is no urgency, a wait of four to six weeks and another examination will probably settle the matter without the expense of special laboratory tests. When there is urgency, on account of the pelvic condition or the patient's anxiety to settle the uncertainty, there are reliable tests which aid in the diagnosis.

Most of the pregnancy tests commonly used are based on reactions in test animals—mouse, rabbit, rat, or frog—to high levels of hormones which occur during pregnancy. It is known that large amounts of estrone and progesterone are produced by the placenta, and, as Zondek discovered, the placenta also produces a pituitary-like hormone. He called this chorionic gonadotrophin which is excreted in the urine, prolan, to differentiate it from the true secretion of the anterior pituitary gland, which, though similar to it, is not identical.

In immature mice, rats, and rabbits this hormone has the property of stimulating: first, follicle ripening and induction of vaginal estrus; second, hyperemization of the ovary and follicular hemorrhage; and, finally, ovulation and corpus luteum formation. The sequence and time relations of these reactions are constant, but the reaction does vary with the species of animal used, the method of administration, and the type of hormone, follicle-stimulating or luteinizing.

The ovarian changes used as end points are: in the rabbit, ovulation and corpora hemorrhagica; in the rat, hyperemia and ovulation. In the frogs the end point is the extrusion of ova or sperm; this reaction is dependent upon the luteinizing fraction of the chorionic gonadotrophin. When urine is used, it should always be the first morning specimen.

There are various other tests based on chemical procedures (pregnanediol, estrone, histidine, sensitization skin tests (colostrum), and reaction to drugs

(Prostigmin); some of these offer promise, but at present none are as satisfactory as the above-mentioned animal tests.

**Aschheim-Zondek Test.**—In the original test, immature mice three weeks old weighing about 8 grams were injected subcutaneously with 0.3 to 0.5 c.c. of filtered urine three times daily for two days. The mice were killed ninety-six hours after the first injection and the ovaries were examined for the "Blutpunkt" or corpora haemorrhagica. Because of its greater sensitivity to the chorionic gonadotropin and its ability to resist certain toxic factors in the urine, the immature rat has been used by some laboratories. Twenty-one- to twenty-three-day-old rats are injected twice daily for three days with 1 c.c. of urine, and on the fifth day they are killed and the ovaries are checked for corpora lutea. The results of either of these tests have an accuracy of 98 to 99.5 per cent.

**Friedman Test.**—In the original test a virgin doe rabbit, weighing 3 or 4 pounds, was given intravenously 4 c.c. of urine three times a day for two days. The amount of urine and the time of administration have been varied by different laboratories, and blood has sometimes been substituted for urine. Twenty-eight hours after the first dose the rabbit is anesthetized and the ovary examined. If no corpora haemorrhagica are found on gross inspection, the abdomen is closed and the rabbit is saved for future tests. Since the Friedman test is just as accurate as the Aschheim-Zondek test and the result can be read in forty-eight hours instead of ninety-six, it is the one most generally used.

**Rat-Hyperemia Test.**—This test is based upon color changes in the ovary of the immature rat due to hyperemia, previously described. This starts within an hour after the subcutaneous or intraperitoneal injection of 2 c.c. of urine and is at its maximum twenty-four hours later. In the literature one finds these tests described as two-hour tests, six-hour tests, or twenty-four hour tests; these various times merely indicate the elapsed time from the injection of the urine until the reading of the end point. The difficulty of interpreting the color changes in the ovary make the accuracy of this test only about 96 per cent. However, a recent report on 1,042 cases tested by the Salmon modification of the original rat test was made by Kelsey, Salmon, Davis, and Hamblen. They found that the test gave 98.94 per cent accurate results and that it was easier to perform and cheaper than the Friedman or the Aschheim-Zondek test.

**Frog Tests.**—These tests are based on the early work of Hogben who found that the female South African clawed toad (*Xenopus laevis*) began to extrude eggs within four to eighteen hours after injection of 40 c.c. of whole pregnancy urine into its dorsal lymph sac. In 1947 Galli Mainini reported that the male giant South American toad (*Bufo arenarum*) liberated sperm into the urine within two hours after injection of 10 c.c. of pregnancy urine into the dorsal lymph sac. Since then, many workers have reported on reactions in various toads and frogs. The male seems to be much more sensitive to the chorionic gonadotropin than the female. The *Rana pipiens* (common green frog), which is used most extensively in this country, responds to 5 c.c. of urine or blood serum. The test is done as follows: Two frogs are used, one being given 2.5 c.c. and the other 5 c.c. of whole urine. These amounts

are injected intraperitoneally or into the dorsal lymph sacs of the two frogs. In one and two hours cloacal fluid is obtained from the external orifice by means of a glass pipette or by gentle pressure and is placed on a slide. Presence of sperm is designated as a positive test and total absence of sperm after five hours is a negative test.

Haskins and Sherman modified the frog test, using an assay of the serum gonadotropin. They used this test to determine the quantitative bioassay at various times in pregnancy.

Included in an excellent evaluation of the test by Marsters, Black, and Randall are some helpful notes on care and feeding of the *Rana pipiens*. The test is simple, accurate, and economical and is rapidly replacing the other pregnancy tests.

It should always be remembered that no test is infallible nor can it indicate the type of pregnancy present. The tests are positive only if viable chorionic villi are in contact with the maternal circulation, and hence missed abortion may give a negative test. In exceptional cases of proved normal pregnancies the test has been consistently negative; hence the test should not supplant but supplement clinical judgment.

**Chemical Tests.**—Since few of these tests are in general use, the details of technique will not be discussed.

**Pregnanediol.**—The Mack-Parks test depends upon the formation of a white precipitate of impurified pregnanediol in the urine of women in the postovulatory phase in the normal menstrual cycle and during pregnancy. The Guterman test utilizes a color reaction to detect the urinary pregnanediol.

**Estrone.**—The Richardson test is a color reaction which demonstrates free estrone in the urine with sufficient accuracy to compete with the biologic tests. In a recent article Richardson, in a study of 2,560 tests on 1,640 patients, obtained 99.1 per cent positive tests in pregnant women and only 0.9 per cent false positive tests.

The only special equipment needed are two special test tubes and four reagents. The test can be performed in the office, is very inexpensive, and requires only thirty minutes for the result. The test gives a positive reaction earlier in pregnancy than any other known test. If the accuracy and simplicity of this test can be confirmed by other workers, it will undoubtedly supplant the more tedious and expensive biological tests.

**Histidine.**—Carson-Sacks test is based on a chemical color reaction for histidine which Voge found to be present in pregnancy.

**Sensitization Skin Tests.**—These are based on the assumption that an allergic wheal is produced when some particular substance common to pregnancy is introduced intradermally into a pregnant woman. Gurskin used placental extract, while Falls, Freda, and Cohen used colostrum collected from primiparous women.

**Prostigmine Test.**—This test is based on the suggestion by Hechter, Lei, and Soskin that uterine bleeding could be precipitated in women whose periods were delayed by causes other than pregnancy or endocrine dysfunction. Winklestein reported that not only was the test inaccurate but in some cases it caused adverse symptoms and in one case profound shock.

A pregnancy test based upon the histaminolytic activity of the serum during pregnancy has recently been proposed by Anne C. Dodge.

### ENDOCRINE INVESTIGATIONS

The various extragenital examinations mentioned in the list of examination measures belong to general medicine, where the methods are given in detail along with the diseases concerned. Specific tests for hormonal dysfunctions (ovarian, pituitary, adrenal, and others) will be discussed under the chapters dealing with the various endocrine disturbances. It seems advisable, however, to make particular mention here of endocrine disturbances. Endocrine deficiencies cause pelvic disorders which are sometimes first recognized by some general manifestation. There are certain bodily changes that point to serious endocrine disturbances having a bearing on the origin of



A.

B.

Fig. 218.—Diagnostic facial signs in myxedema (hypothyroidism). A, Before treatment; B, after treatment. (From Harrell: *South. M. J.*, February, 1952.)

pelvic symptoms. These disturbances are due to defective functioning of the system of endocrine glands—the normal balance of influences being disturbed by hypoactivity or hyperactivity of one or more glands, with resulting reactions on the remaining parts of the system. Clinically the thyroid is probably the most important general endocrine gland affecting pelvic function. The exact mechanism of this thyroovarian relationship is still not clearly understood. Since the function of the thyroid is to stimulate the metabolism of body tissues generally, it undoubtedly accelerates ovarian and pituitary activity, with resulting effect on gonadal function. Whether the specific action is direct or is mediated through the pituitary or adrenal is a question that is still unsettled. The following symptoms would lead one to suspect

hyperthyroidism: The patient is a nervous, excitable individual with rather anxious or worried expression and has a florid face with wide palpebral fissure, expressed in lay terms as "popeyed." The skin is warm and the palms are usually moist. There is a fine tremor of the fingers; the pulse is rapid. These patients usually give a history of decrease in the amount and duration of the menstrual flow.

The hypothyroid individual has very few visible signs unless the basal is very low; then one has the typical picture of myxedema (Fig. 218). In mild cases the skin is dry and scaly, the hair is usually a little coarser than usual, the pulse is slow, and the blood pressure is usually low. The history reveals that the patient tires easily, gets sleepy in the afternoon, is irritable over small things which she knows should not bother her, and gets depressed and cries easily. Her nails crack and her hair comes out excessively with combing. She frequently suffers from constipation. In the pelvic history the hypothyroid individual usually has a late menarche, the periods are very irregular at first with a tendency to go overtime and skip frequently. In married women common complaints are sterility and frigidity.

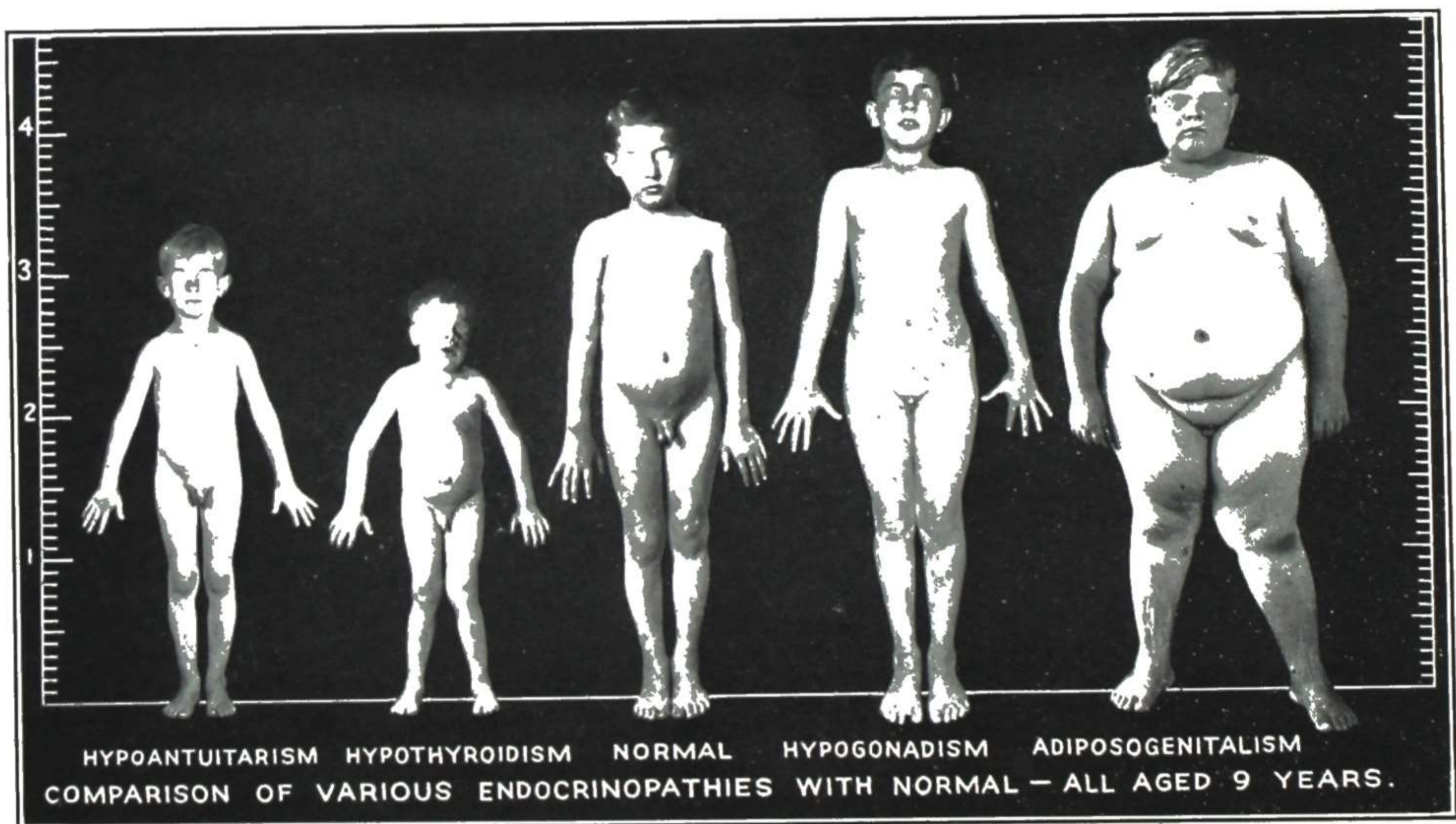


Fig. 219.—Showing striking characteristics of various endocrinopathies in patients of the same age (9 years) compared to normal child (center). (From Turner: South. M. J.)

The basal metabolism should be tested halfway between the periods, and two tests should be done about fifteen to twenty minutes apart. As is well known, the basal metabolism is not always an accurate index of hypothyroidism. If a patient has several of the signs and symptoms indicating low thyroid function, we usually give a therapeutic test with thyroid even though the basal is zero. In general, a grain of desiccated thyroid to a  $-10$  metabolism is used. Other tests are blood cholesterol and iodine uptake.

In regard to other endocrine disturbances, the complexity of the endocrine system and the various direct and indirect actions and reactions produce mixed clinical pictures. Confusing contradictions are met in the symptomatology of

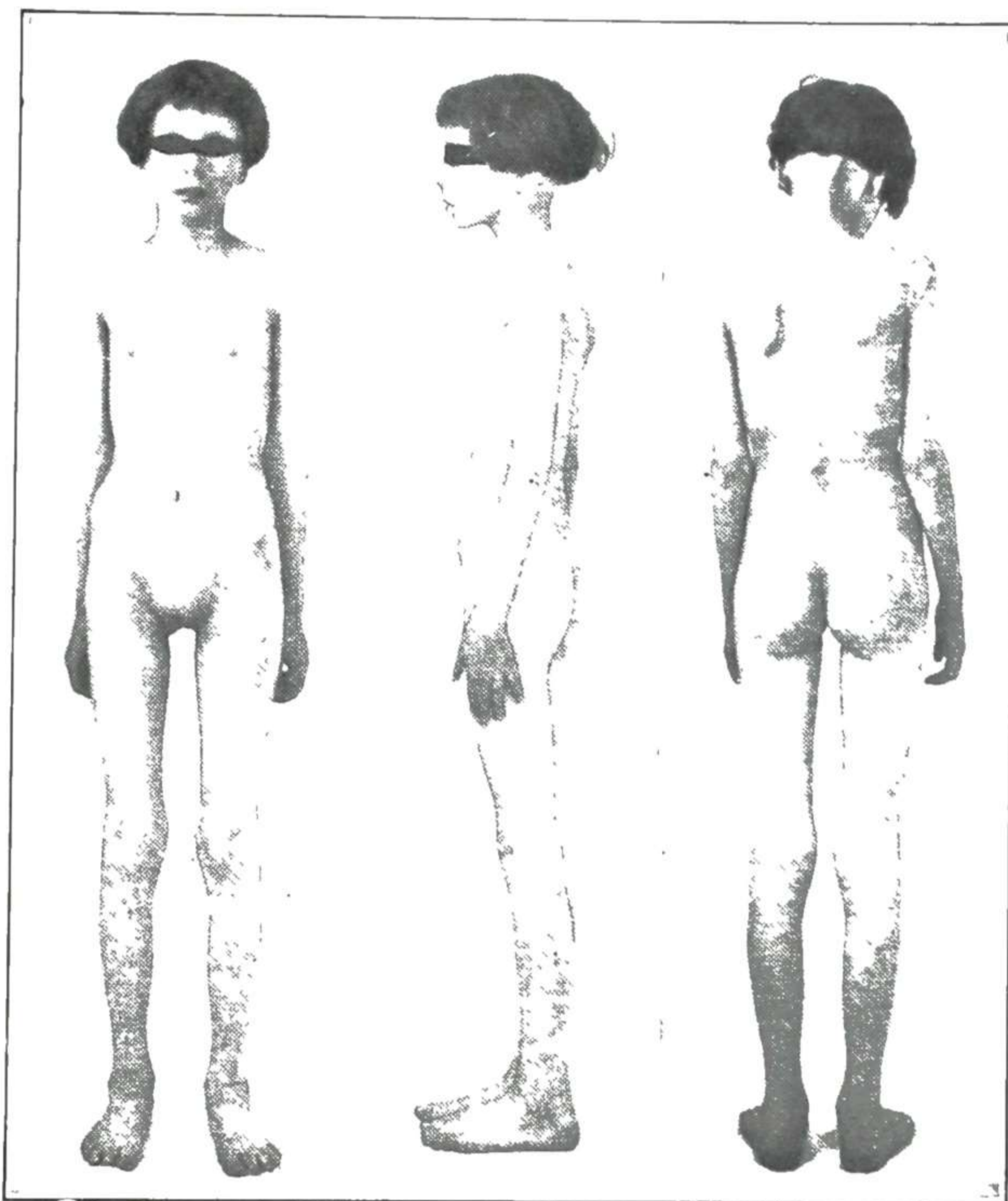
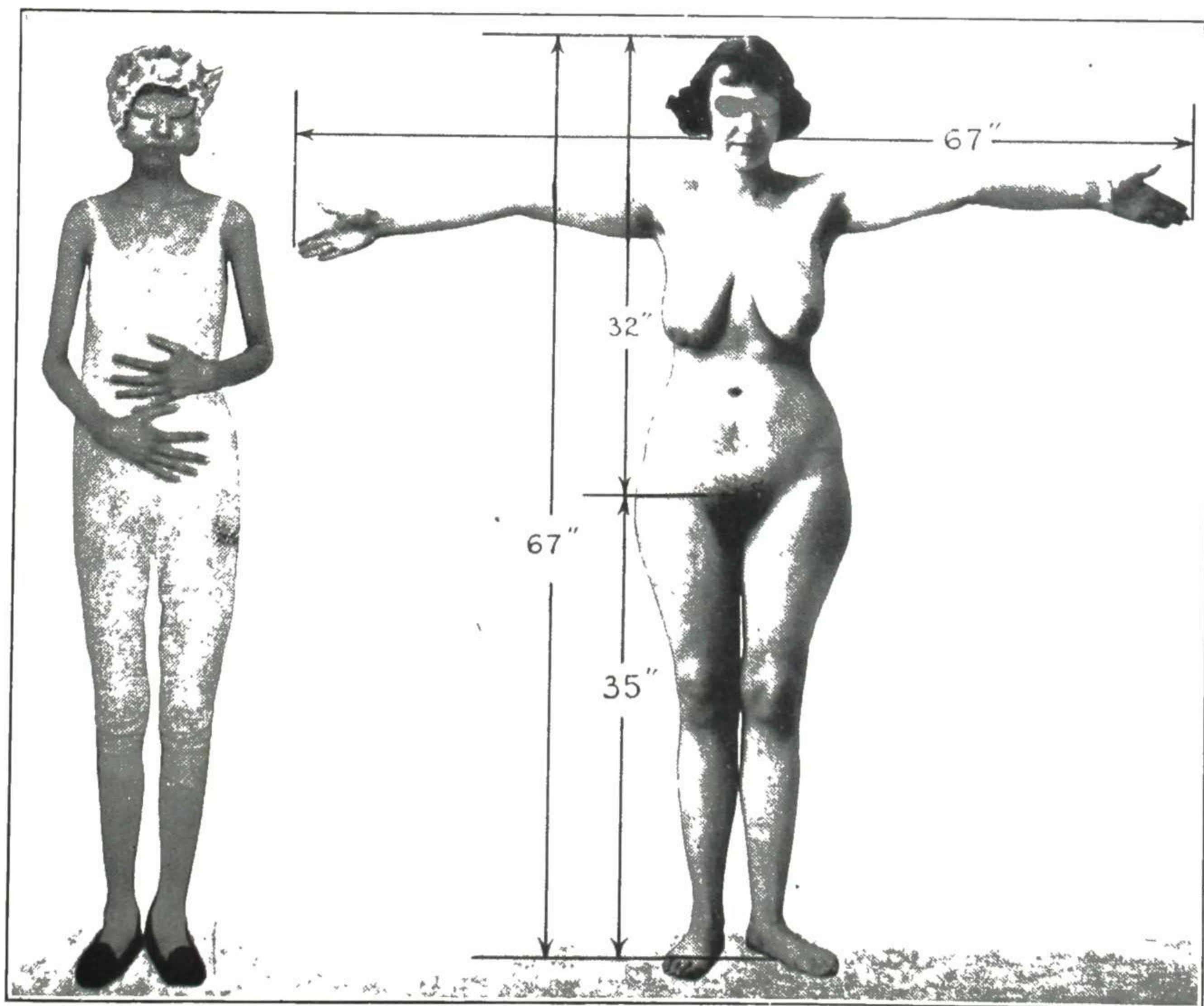


Fig. 220.—Primary hypogonadism in a fourteen-year-old girl. Note the eunuchoid build, absence of primary and secondary sex characteristics and malnutrition. (From Turner: South. M. J.)



A.

B.

Fig. 221.—Primary hypogonadism, (A) before treatment, (B) six months after replacement therapy. Note the classical eunuchoid measurements: height equaling span; lower exceeding upper. (From Engelbach: Endocrine Medicine, Charles C Thomas.)

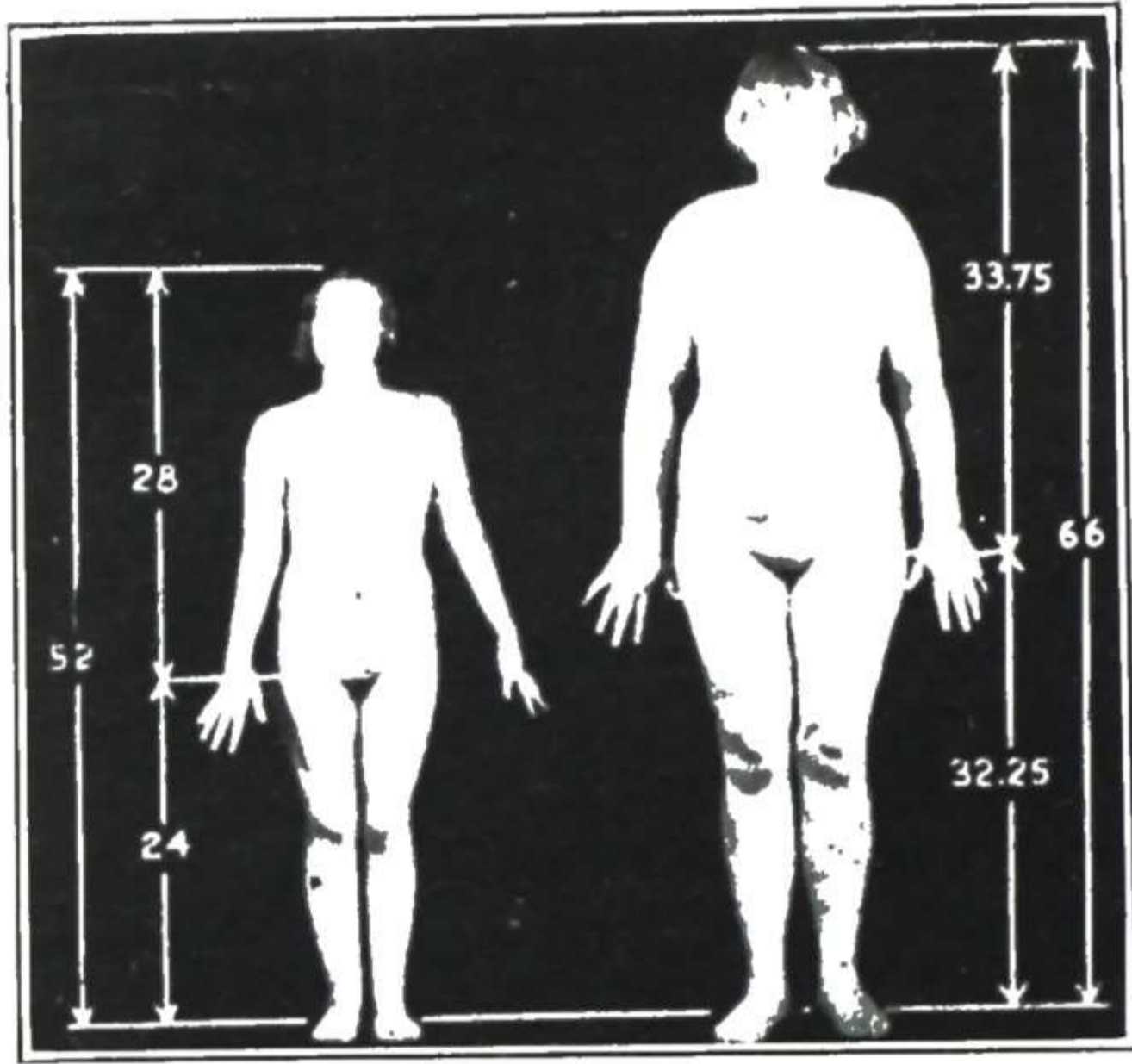


Fig. 222.

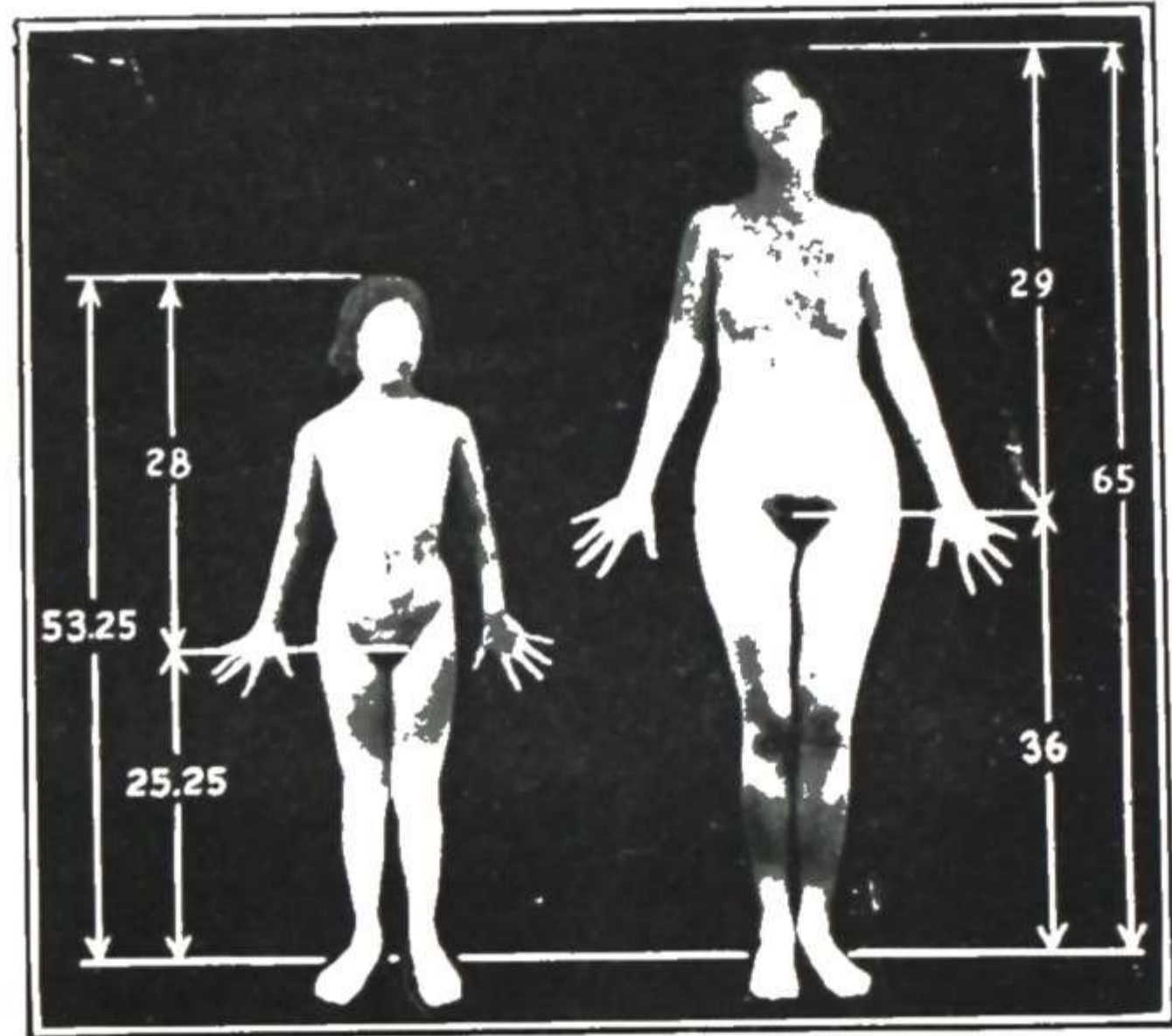


Fig. 223.

Fig. 222.—Hypoantuitarism (left), aged twenty years, compared with adiposogenitalism, aged thirteen years. (From Turner: South. M. J.)

Fig. 223.—Hypoantuitarism (left), aged sixteen years, compared with hyperantuitarism aged ten years. Contrast dwarfism and agenitalism with statural and genital overdevelopment of the latter. (From Turner: South. M. J.)

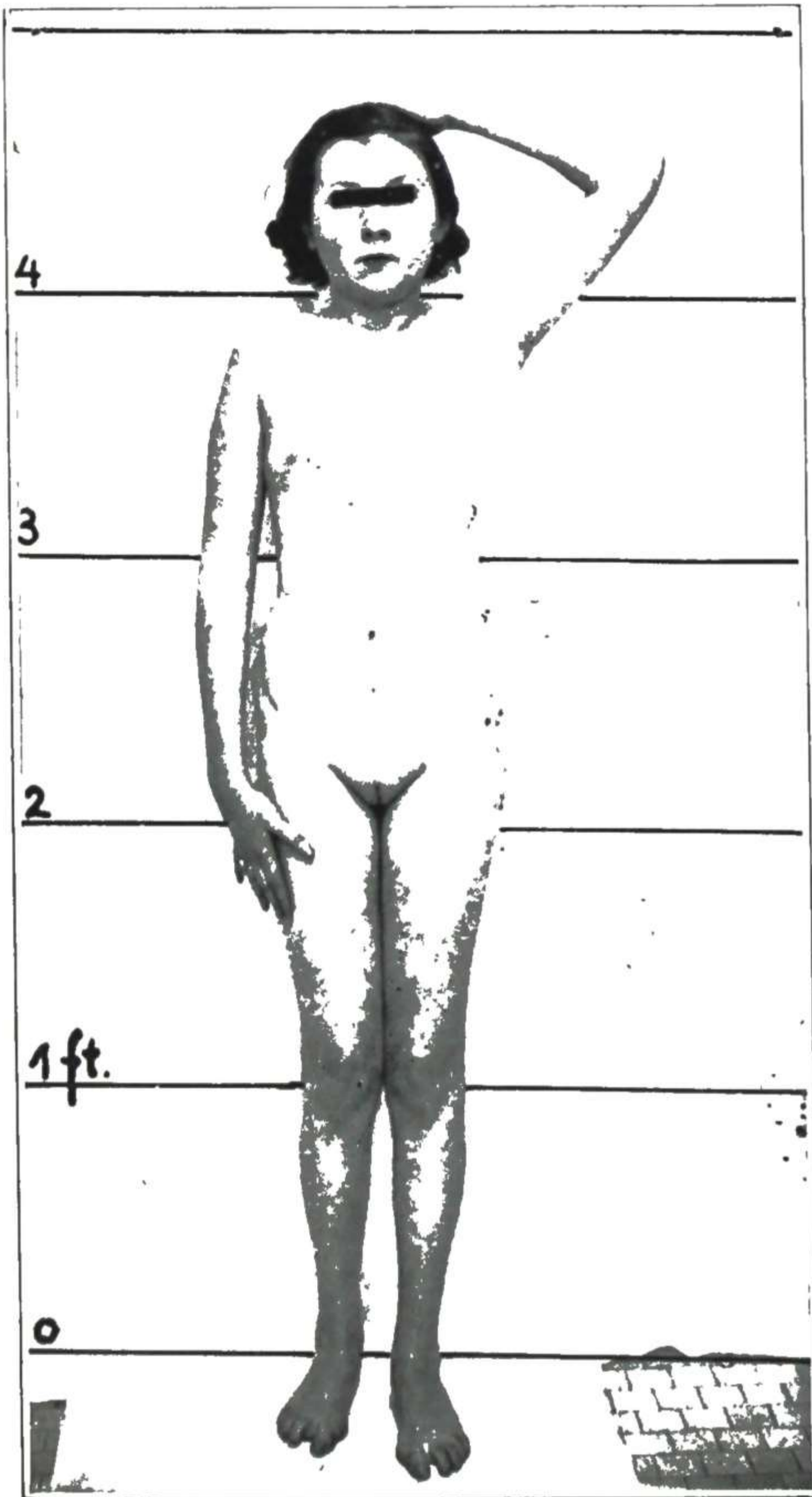


Fig. 224.

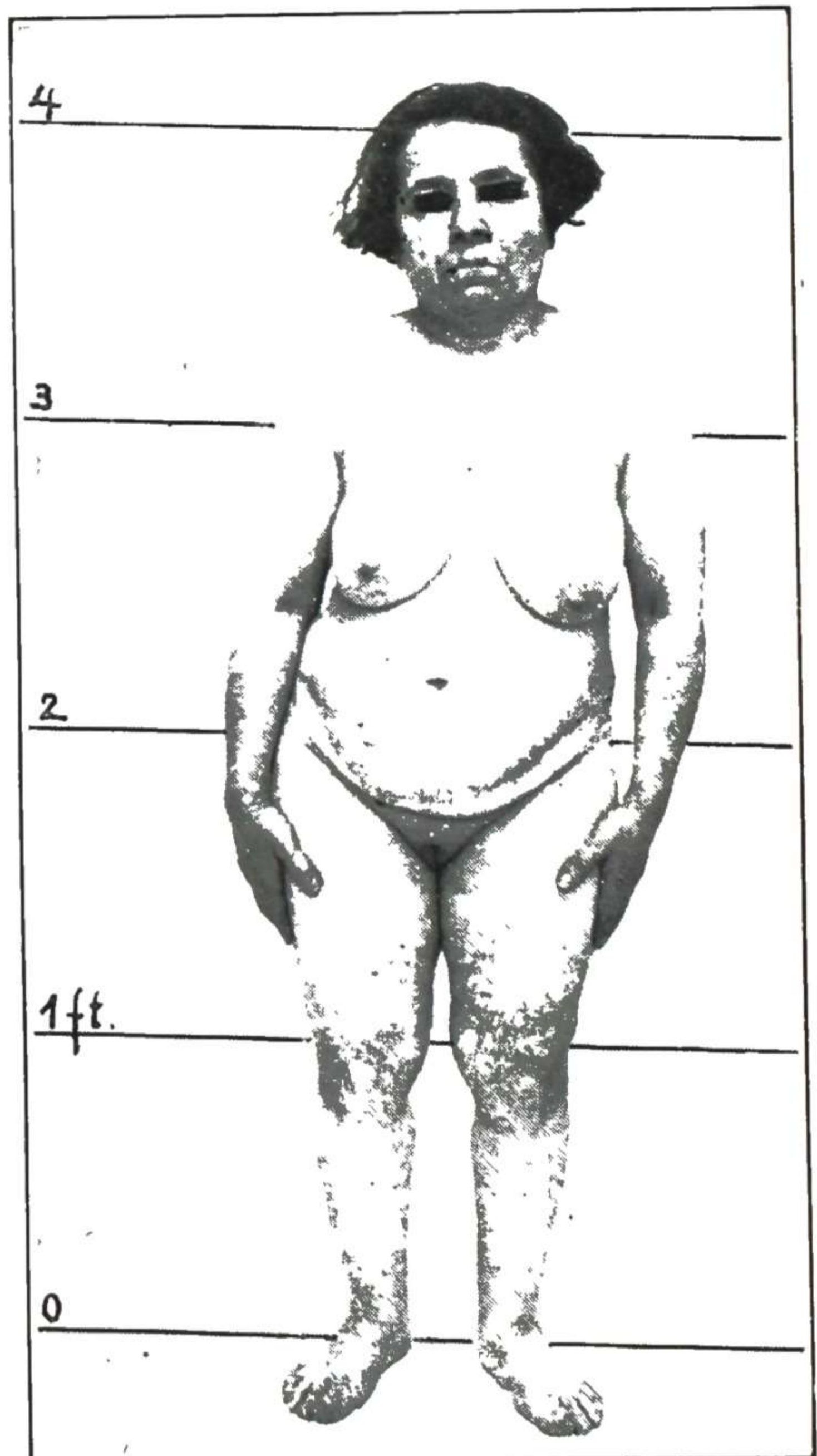


Fig. 225.

Fig. 224.—Pituitary dwarfism, Lorain-Lévi type. Age, eighteen years; height, 4 feet, 8 inches; gracile build; weight, 84 pounds; progeria; never menstruated; poor development of secondary sex characters. Patient has large, eroded sella, but no eye symptoms. To be operated upon.

Fig. 225.—Pituitary dwarfism, Fröhlich type. Adult female, 4 feet, 3 inches in height; deficient pubic and axillary hair; amenorrhea; sterility. (From Frank: Endocrine Aspects of Gynecology, Thos. Nelson & Sons.)



many cases, and a comprehension of any case requires considerable knowledge of the whole subject. All we can hope to do here is to point out certain general signs which should arrest attention and lead to detailed study of the case along these lines.

In childhood endocrine disorders produce their most serious and irremediable effects, and it is important to watch for them, particularly as the age of puberty is approached. Fig. 219 shows four children with endocrine disturbances compared with a normal child of the same age. In both sexes there is close coordination between the gonads and the general endocrine system, and disturbances centering in one or the other give rise to a great variety of symptomatic patterns.



Fig. 226.

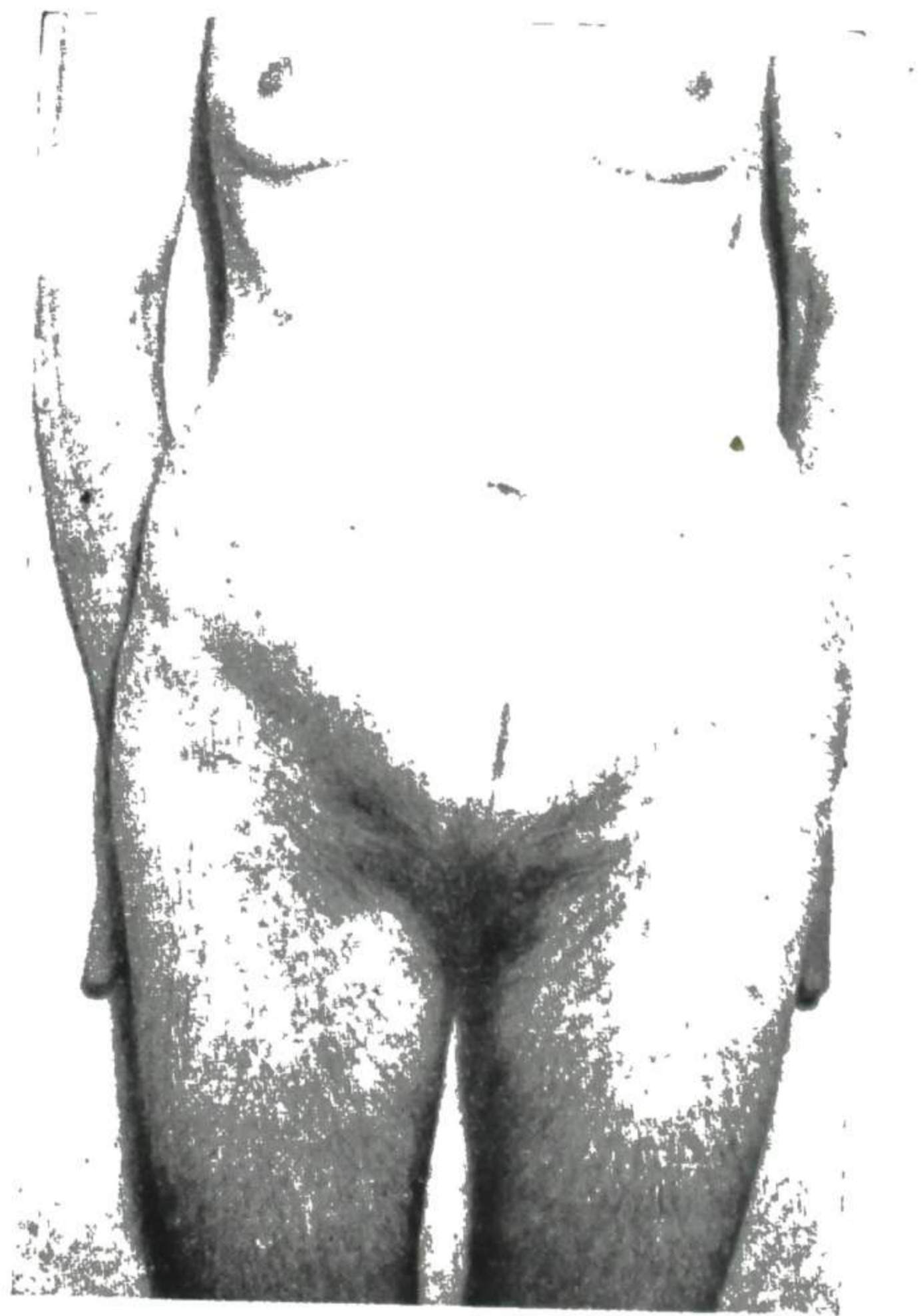


Fig. 227.

Fig. 226.—General hirsutism from an arrhenoblastoma of the ovary.

Fig. 227.—Disappearance of excess hair after removal of the ovarian tumor. (From Maxwell: West. J. Surg.)

The development of the underlying disorder is so gradual that it may be overlooked. The patient comes complaining of some apparently minor disorder, such as delayed beginning of menstruation or missing at times or excessive menstruation, with perhaps an incidental remark that she is too stout or too thin. Fig. 220 shows an amenorrheic girl of fourteen with agenesis of the ovaries. Fig. 221 shows what recognition of the trouble and appropriate treatment can do, even though treatment was begun too late to change the bony maldevelopment.

In Figs. 222 to 225 are shown departures from normal statural development resulting from unrecognized, and hence long-continued, pituitary and gonadal endocrine disorders. Hirsutism, or abnormal hair development on face and body, called also hypertrichosis, may be caused by gonadal disorders of various types. The particular location and distribution of the abnormal hair indicate whether the gonadal disturbance is of the hypertype (increased femininity) or of the hypotype (tendency to masculinity). Fig. 226 shows development of general hairiness due to an arrhenoblastoma of the ovary. Fig. 227 shows the return to normal after removal of the tumor.

Endocrine cases present certain history items and examination findings which identify them. Some of this information has been brought out in the discussion of thyroid symptoms and signs, while some requires special inquiry and investigation. The additional items of special importance in the history are: age at menarche and regularity and amount of flow during puberty; growth curve with loss or gain of weight; hair texture and distribution; premature graying or excessive loss of hair with combing; nails normal or brittle.

Under examination, certain items are of special importance in pelvic endocrine dysfunction. Type of build, and measurements such as height, span, and symphysis to floor and symphysis to crown, which give an index of bone growth and epiphyseal closure, are very helpful in diagnosis since they are influenced by various endocrines. Fat distribution is important, as is general state of nutrition. The secondary sex characteristics such as amount and distribution of hair on the face and the pubic areas (male and female escutcheons) are a reliable index of gonadal function. Pelvic findings, development of labia and clitoris, and size of uterus with relation of size of cervix to fundus all should be noted.

From the gynecologic standpoint it is convenient to group clinical pictures under two main headings: hypogonadism and hypergonadism. At first thought it may seem that these two opposite conditions should present clear-cut clinical pictures, with opposed symptomatology; but such is not the case, and a second thought will show reasons for the confusing mixture of symptoms. Gonadism represents the activity of the gonad gland (ovary in female and testis in male) with the influences back of it, and the primary and secondary changes which its activity produces. The normal activity of the ovary and testis is opposed in some particulars. Some things which are normal in the male constitute abnormal symptoms (masculinity) in the female, and vice versa.

Hypoactivity of the gonad causes a masculine shift in the female and a feminine shift in the male. On the other hand, hypoactivity of the anterior pituitary (the activator of the gonads) produces some effects (growth disorders, etc.) which are identical in male and female and other effects (through the gonads) which are opposite in male and female.

Still another item to be considered is the fact that potentially testicular cells are found in the ovary and potentially ovarian cells in the testicle. Now in such a female patient, the symptoms of masculinity may be due to hypogonadism affecting the female cells or to hypergonadism affecting the male cells. In this individual, hyperfunction of the anterior pituitary may produce femininity or masculinity, depending on which group of cells in the complex ovary is most stimulated. Also some conditions, for example a tumor, may

at first stimulate cells to hyperfunction and later destroy them, producing hypofunction, with a resulting shift in the symptomatology. Furthermore, the structural changes, which are such a striking feature in certain endocrinopathies, depend to some extent on the age of incidence of the disease. Tallness (due to delayed union of long-bone epiphyses), which is characteristic of hypogonadism of early incidence, will be absent in a case in which the hypogonadism does not come on until after epiphyseal union.

These various possibilities must make one cautious in interpreting the significance of the symptoms and signs encountered—even of the marked ones which are so striking that it would seem they should be pathognomonic of some particular lesion. However, the following classification should aid materially in the understanding of the diagnostic significance of the signs and symptoms presented by these patients as they come to the office seeking treatment.

TYPES	CAUSES	SPECIAL SYMPTOMS
<b>HYPOGONADISM</b>		
<p><i>Genital Symptoms</i> Menstruation absent or scanty. Sterility or miscarriage. Libido absent or diminished. Poor development of genitals and sex characteristics. Tendency to masculinity. Deficiency in sex hormones.</p> <p><i>General Symptoms</i> Weak, tired, atonic. Poor appetite and tendency to nausea, vomiting. Basal metabolism normal or low. Structural signs depend on type (ovarian, pituitary, thyroid, or adrenal).</p>	<p>Primary (ovary at fault)</p> <ul style="list-style-type: none"> <li>Underfunction of ovary</li> <li>Castrated or menopause</li> <li>Arrhenblastoma</li> </ul>	<ul style="list-style-type: none"> <li>If early—patient thin, poorly muscled. Delayed union of long bone epiphyses, tall, longer below pubes than above (Figs. 220 and 221, A).</li> <li>Tendency to obesity and neurovascular disturbances (hot flushes, depressed).</li> <li>Masculinity tendency is marked.</li> </ul>
	<p>Secondary (other glands at fault)</p> <ul style="list-style-type: none"> <li>Pituitary</li> <li>Thyroid (hypothyroidism)</li> <li>Adrenal (tumor late stage)</li> </ul>	<ul style="list-style-type: none"> <li>Anterior lobe hypoparathyroidism</li> <li>Bilobar (adiposogenitalis)</li> <li>Depressed, easy to weep or be irritated. Fat deposits, coarse hair, myxedema. Basal metabolism low and blood pressure low. (Fig. 218.)</li> <li>Masculinity—marked development of male characteristics.</li> </ul>
<b>HYPERGONADISM</b>		
<p><i>Genital Symptoms</i> Early sexual maturity. Free menstruation. Fertile. Libido increased. Excess of sex hormones.</p> <p><i>General Symptoms</i> Energetic, hyperactive. Good musculature. Normal fat. Basal metabolism normal or high. Structural changes depend on type (ovarian, pituitary, thyroid, adrenal).</p>	<p>Primary (ovary)</p> <ul style="list-style-type: none"> <li>Overfunction of ovary</li> <li>Granulosa-cell tumor</li> </ul>	<ul style="list-style-type: none"> <li>Excess menstruation. Endometrial hyperplasia.</li> <li>In early life—precocious sexual development. Short, stocky. After menopause—renewed sexual activity.</li> </ul>
	<p>Secondary (other glands)</p> <ul style="list-style-type: none"> <li>Pituitary (hyperparathyroidism)</li> <li>Thyroid (hyperthyroidism)</li> <li>Adrenal (tumor early stage)</li> </ul>	<ul style="list-style-type: none"> <li>Statural overdevelopment, gigantism. Tall, well-muscled, no excess fat. Sexual overdevelopment (feminine). (Fig. 223.)</li> <li>Mixture of hyperthyroid symptoms with sexual speeding-up.</li> <li>Hypertrichosis (Fig. 226) and usually a tendency to male type. Musculature firm, athletic type. Some adiposity. Early epiphyseal union, short, stocky.</li> </ul>

**GAS TEST FOR TUBE PATENCY**

On Nov. 3, 1919, I. C. Rubin performed the first tubal insufflation, and in 1948 he was given an award by the American Society for the Study of Sterility for outstanding work in sterility.

Since 1919 this procedure has become the one universally used, and the volume of literature on the subject was brought together and published in 1947 in a book by Rubin entitled *Uterotubal Insufflation*.\* It is recommended for the physician desiring more complete discussion of statistics, details of procedure, and diagnostic interpretation.

By introducing carbon dioxide into the uterus under measured pressure, the patency or occlusion of the fallopian tubes may be established. If either tube has a normal patency, the gas pressure rises from about 70 to 100 mm. Hg, and then falls rapidly to about 40 mm. Hg as the gas passes into the abdominal cavity. Confirmatory evidence that the gas has passed through the tube is the occurrence of shoulder pain when the patient assumes the sitting position. This is a referred pain due to the pressure on the diaphragm, and, when characteristic, it is pathognomonic of patency. If the pressure rises to 200 mm. Hg without a fall, this signifies that the gas cannot pass through, i.e., both tubes are closed. One negative test does not necessarily mean that the tubes are permanently closed, for tubal spasm will sometimes resist the passage of the gas even at fairly high pressure, requiring subsequent tests as mentioned later.

**Indications.—**

1. The test is a step in the systematic examination of a sterility patient. It should not be used until evident causative lesions of the lower genital tract have been eliminated and the husband's fertility has been established by the Huhner test or otherwise.

2. As a therapeutic aid in opening closed tubes. In a total of 2,000 cases of infertility, Rubin reported 205 cases of pregnancy following uterotubal insufflation. Some of these cases were in women over thirty years of age, married five years, who had used no contraceptive measures for a year. Some of these patients became pregnant without other therapeutic measures within one month after insufflation. In his book he reports the final outcome of 517 postinsufflation pregnancies; over 81 per cent had full-term babies. In a review for the period 1920 to 1940, he reported 5,269 insufflations with 32.4 per cent complete obstructions and 33.1 per cent partial obstructions.

3. During laparotomy for closed tubes insufflation from below is an accurate method for proving that patency has been attained.

**Contraindications.—**

1. Bleeding from the uterus or purulent discharge.
2. Recent pelvic inflammation or tenderness.
3. Large pelvic tumors or tumors associated with inflammation.
4. Serious cardiac or respiratory disease or fever.
5. Free bleeding on insertion of cannula (usually means cervicitis, acute or subacute).
6. Pregnancy.

\*The C. V. Mosby Company.

**Apparatus.**—The apparatus for the introduction of the gas consists of (1) a metal cannula of the Keyes-Ultzman type, with several small perforations near its tip and fitted with a conical rubber stopper, (2) an arrangement for measuring the gas as it passes through water, (3) a manometer for measuring the gas pressure, and (4) the tank containing the gas to be used, i.e., carbon

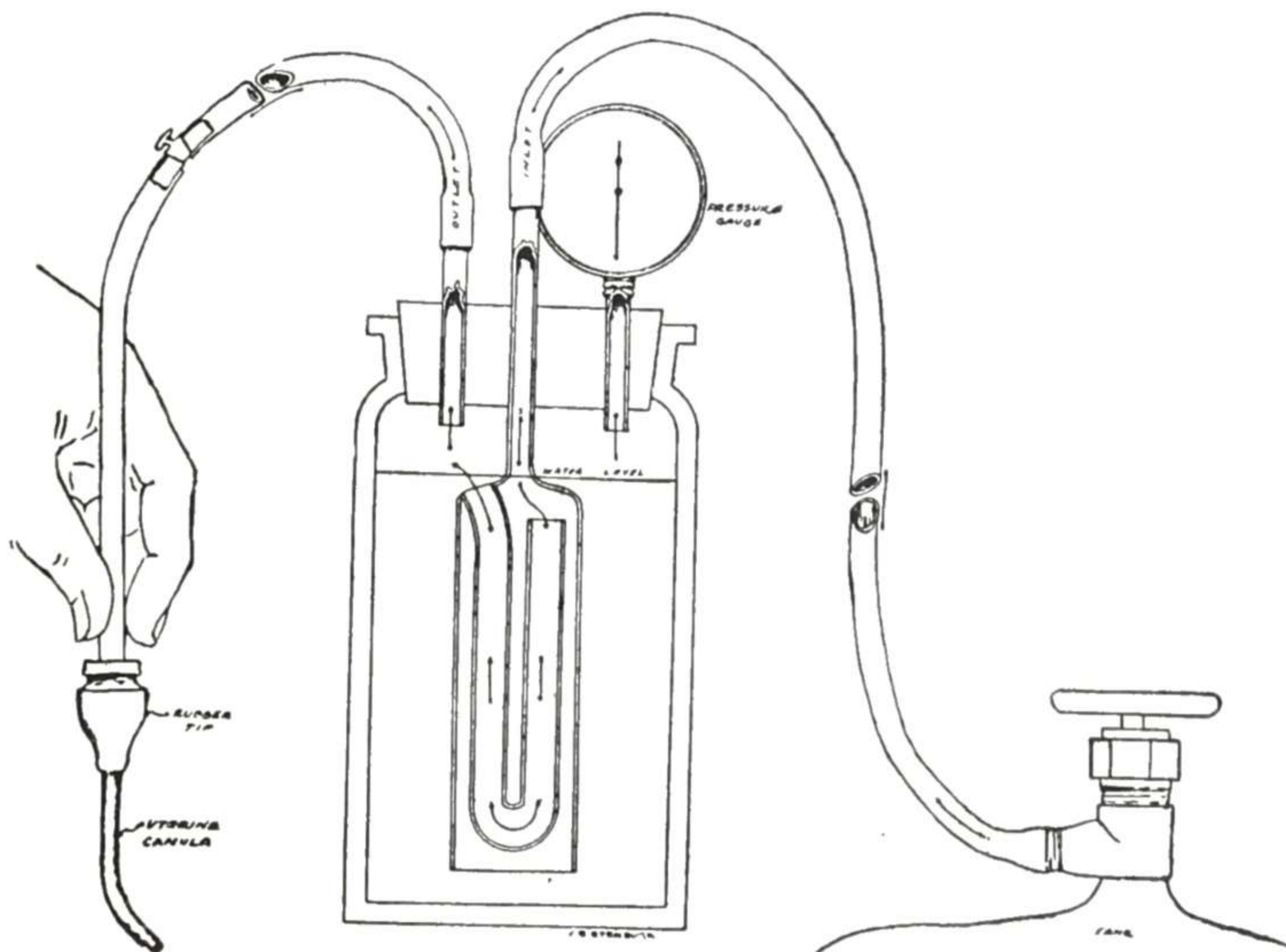


Fig. 228.—Diagram showing the principles of the apparatus for tubal insufflation. The gas flows from the tank through the tubing into the inlet of the pulsating gas meter. The inflowing gas displaces the water in such a way that each pulsation of the meter equals about 40 c.c. of gas. The outflowing gas flows through the rubber tubing leading to the cannula. Between the meter and the cannula is a needle valve conveniently placed for regulating the rate of gas flow. The cannula is equipped with a rubber stopper for the purpose of preventing leakage at the cervical os. The pressure gauge shows the pressure under which the gas is introduced. A mercury manometer may be used for this if desired. (From Rubin: *Am. J. Roentgenol.*)

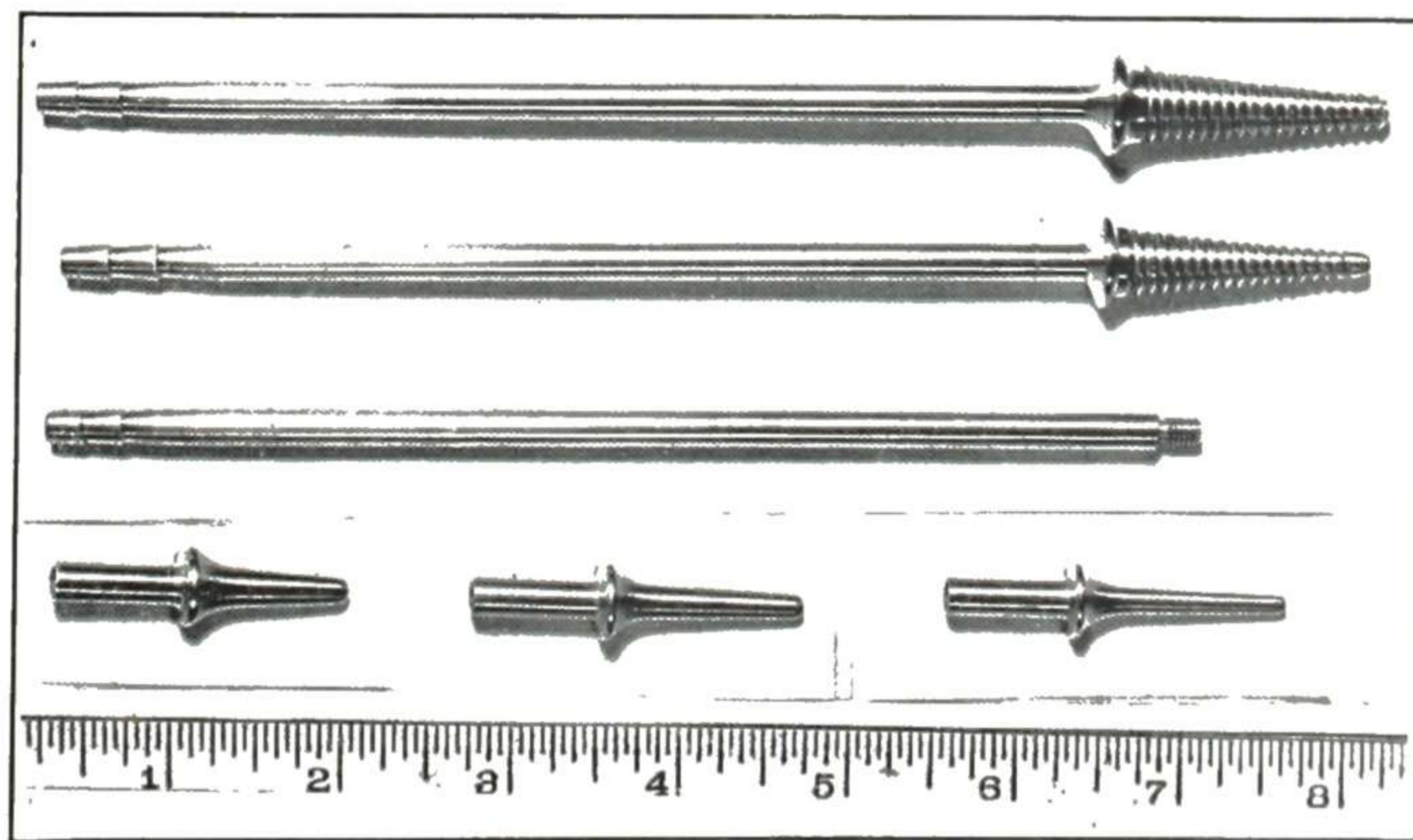


Fig. 229.—Colvin type of cervical applicators for tubal insufflation and uterosalpingography. The screw tips for insertion in the cervix are to obviate the necessity of counter-traction with a tenaculum forceps to prevent leakage. (From Colvin: *Am. J. Obst. & Gynec.*)

dioxide or oxygen, preferably the former. It is well to have a needle valve, for releasing the gas pressure, at a convenient part of the tube near the uterine cannula. The ordinary apparatus is shown in Fig. 228, and a screw type is shown in Fig. 229.

A single and compact instrument was recently reported by Weisman. There are many modifications, some with kymograph attachments for recording tubal and uterine contractions. These, though very necessary in working out tubal physiology, are not essential for the Rubin test.

**Technique.**—The best time for the test is from four to seven days after the beginning of menstruation. At this time the endometrium is lowest and is least liable to infection; there is less chance of blowing bits of endometrium into the abdominal cavity; and the possibility of interfering with an existing pregnancy is eliminated.

1. The apparatus is tested and the necessary instruments and parts are sterilized. The rate of flow is adjusted so that the mercury rises 100 mm. Hg in fifteen seconds.

2. The patient is placed in the dorsal position with hips elevated, a bivalve speculum is inserted, and the cervix is painted with a suitable antiseptic.

3. The uterus is sounded to ascertain the direction of the canal and to be sure that there is no stenosis of the internal os. If there is some stenosis, dilatation is done with a uterine dressing forceps.

4. The anterior lip of the cervix is then grasped with a two-toothed tenaculum and the modified Keyes-Ultzman cannula is inserted into the uterine canal so that the point is well above the internal os and the rubber stopper fits snugly into the external os.

5. The needle valve is opened and the gas allowed to flow into the uterine cavity while the operator watches the pressure on the manometer. During this time the rubber stopper must be kept tightly pressed against the cervix to prevent leakage of gas. If there is any leakage, it can usually be heard.

6. The pressure should be watched carefully and not allowed to rise above 200 mm. Hg. Four pulsations of the siphon meter, or 160 c.c. of gas, are all that is required to show patency. Two or three pulsations, or from 80 to 120 c.c., will suffice in thin individuals. Sharman uses 250 mm. Hg as a routine with no ill effects and he has found that the higher pressure has increased the accuracy of the test considerably.

7. After the test has been completed, the gas is turned off and the cannula is withdrawn. Replace the uterus in the anterior position. If there is any oozing after withdrawing the cannula, a dry vaginal tampon may be inserted.

8. Have the patient sit up, and ask her if she notices any pain. If the shoulder pain is very troublesome, have her assume knee-chest position for five minutes. The gas is usually partially absorbed in this time and the pain disappears.

9. In doubtful cases where the shoulder pain is not characteristic, an x-ray plate may be necessary to demonstrate the pneumoperitoneum. This happens occasionally in stout patients.

**Interpretation.**—The decision as to whether the gas has passed through the tubes is based on two factors: the manometer reading and the patient's symptoms. With the normal patent tube there is an initial rise to 70 to 100 mm. Hg, followed by a fall in pressure or an absence of further rise when the gas begins to go through the tubes. After patency has been established by the manometer reading, check this by having the patient sit up, and inquire if

she has any pain. If the gas has passed through the tubes, the patient will usually notice some pain in the shoulder or clavicle area.

When the tubes are permanently closed, the pressure will rise to 200 mm. Hg without a fall. This pressure should not be exceeded except in rare cases and by one thoroughly familiar with the dangers entailed. If the gas passes through at a pressure between 100 and 200 mm. Hg, the tubes are patent, but there is a partial block, either structural or spasmodic.

Some idea as to the position of the block is gained by having the patient locate the pain. With patent tubes there is only a sense of discomfort felt above the symphysis. When the tubes are closed at the uterine end, there is definite, rather dull pain over the uterus during the test, which disappears rapidly on release of the pressure. Sharp pain well out from the median line on both sides, in some cases radiating down the legs, means the block is at the fimbriated ends of the tubes. Unilateral pain with patency established by drop in pressure usually means the blocked tube on the side of the pain. With the block located between the isthmus and the fimbriated end, the pain is felt just lateral to the uterus.

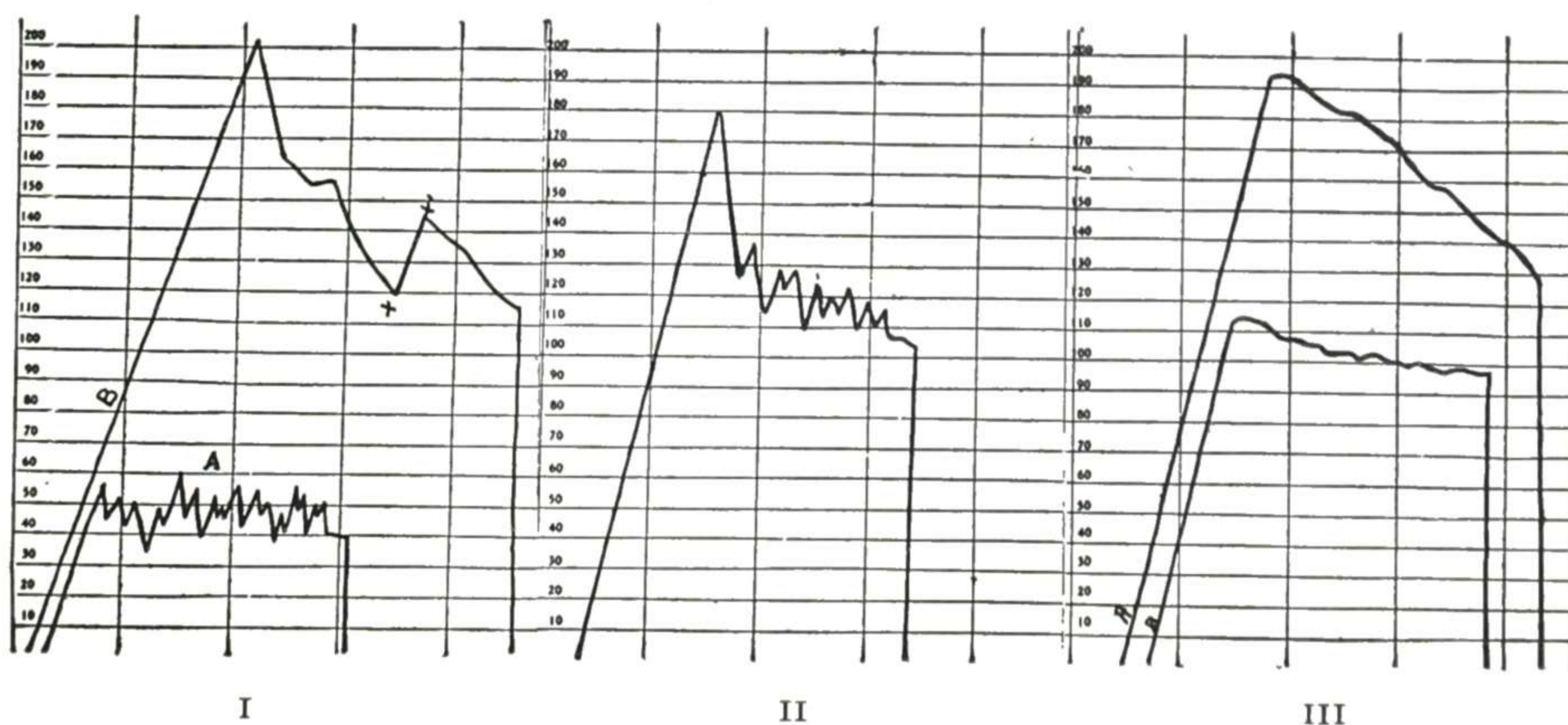


Fig. 230.—Kymograph tracings showing variations in pressure from different causes. *I*, (A) Tracing of a normally patent tube. (B) Tracing in a case of stricture of the tube with slight patency. X-X' shows rise in pressure when patient was instructed to bear down.

*II*, Showing a relatively high pressure before the initial drop, when practically normal peristaltic waves are registered on the kymograph.

*III*, (A) High grade stenosis in a tube probably patent but probably bound down by light adhesions which inhibit normal peristalsis. (B) Less marked stenosis, no definite peristaltic fluctuations visible in the tracing. (From Rubin: Radiology.)

The injection of air or gas with a syringe without measuring pressure and rate of gas flow is not advisable, though it has been recommended by some and instruments have been devised for it. The necessity of knowing the exact pressure and rate of flow for interpretation of conditions has been emphasized by Rubin who insists upon "a slow and careful introduction of the gas rather than an irregular, uncertain and haphazard insufflation." He now uses a kymograph with the apparatus in order to record variations in pressure on a smoked drum. This records the peristaltic waves and is especially helpful in differentiating tubal spasm from structural stenosis (see Fig. 230). As noted previously, it is not essential.

Before making a diagnosis of complete obstruction, it is well to make several tests and to precede one of them with a course of medication to relax the tubal sphincters, for example, 75 mg. of Trasentine three times daily for five days.

**Dangers.**—The unfortunate results occurring after gas injection are rare compared with those reported after oil injection, but they do occur. Mansfeld and Dudits reported a fatal case of air embolism from a Rubin test done in a patient with unrecognized tuberculosis of the endometrium. We had a case of severe pelvic infection after a Rubin test in a patient with a partial stricture of the tubes from an old inflammation probably from an undiagnosed brucellosis infection which later flared up. In a questionnaire that Rubin sent out, he found that in 80,376 insufflations, embolism occurred in 15 women, of whom 3 died. In all the fatal cases oxygen was used instead of carbon dioxide which, as Sharman implies, is an error in the choice of gas used and not in the Rubin test.

## **X-RAY EXAMINATIONS**

### **Visualization of Uterine and Tubal Cavities**

Since the introduction of Lipiodol by Sicard and Forestier in 1922, hysterosalpingograms have been added as important aids in gynecologic diagnosis. The use of oily solutions has been largely discarded in later years because of undesirable complications, such as accidental injection of vessels into which the oil penetrated, embolism, nonabsorption of oil from peritoneal cavity and apparent irritation, and acute peritonitis and abscess formation. These dangers have been overcome by the use of water solutions, such as Diodrast, Skiodan, Iopax, and in our hands the water medium has been adequate and harmless. Use of a new aqueous preparation, Pyeosil (Glaxo), was reported in the English literature by Pollack and Preiskel. This preparation is 35 per cent diodone.

If one wishes a media which will show on the x-ray for a longer time and yet does not have the disadvantages of oil, Rayopake (Hoffmann-LaRoche), has been found excellent by Rubin, Norment, and many others. This is an organic iodine compound in polyvinyl alcohol. In a recent review of 2,500 cases examined, Marshak, Poole, and Goldberger state a preference for water solution as the contrast medium.

Though improved solutions have superseded the original Lipiodol, the procedure is sometimes referred to as the "Lipiodol test" or "Lipiodol injection," meaning visualization of the cavities by injection of any of the numerous solutions; a better term is hysterosalpingography.

#### **Indications.**—

1. To localize the point of tubal obstruction in a patient who has previously been shown to have closed tubes by the gas test for patency.
2. In doubtful and obscure cases it is used to show the location of the uterus and tubes in relation to other masses present.
3. It is helpful in the diagnosis and demonstration of congenital abnormalities of the uterus and tumors in the cavity.
4. Reports of pregnancy following the test in some cases of long-standing sterility indicate that it may have some therapeutic value.



**Contraindications.**—The contraindications to hysterosalpingography are the same as for the Rubin test, and it should be done only after the Rubin test has shown obstruction in the tubes.

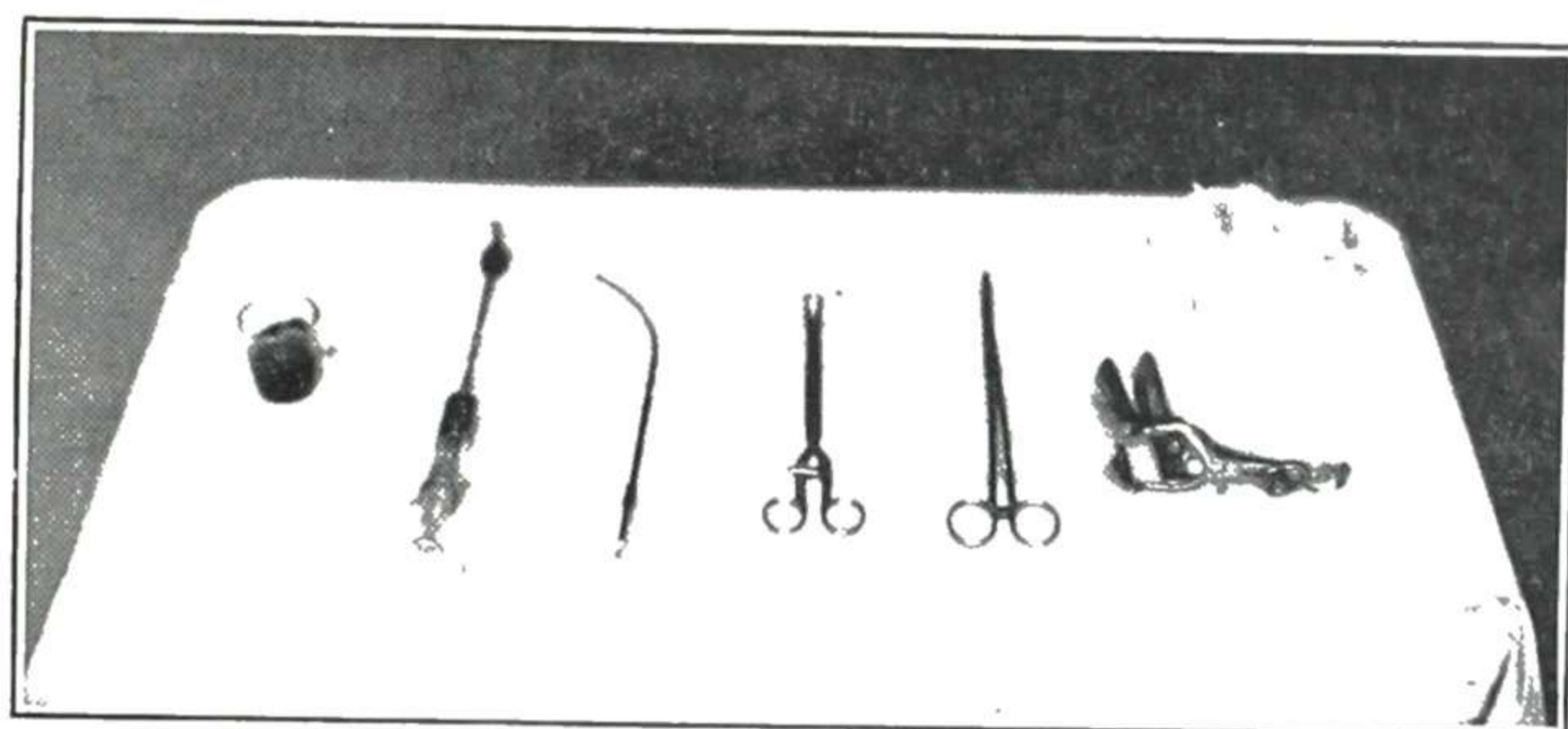


Fig. 231.—Visualization with iodized oil. The articles needed in the technique of the oil injection are here shown. They are, reading from the left, the opaque oil in a sterile medicine glass, the injecting syringe, a uterine sound for testing the direction of the canal and the size of the cavity, a uterine tenaculum forceps for holding the cervix, a uterine dressing forceps, a bivalve speculum, and sterile cotton balls. (From Newell: *Am. J. Obst. & Gynec.*)

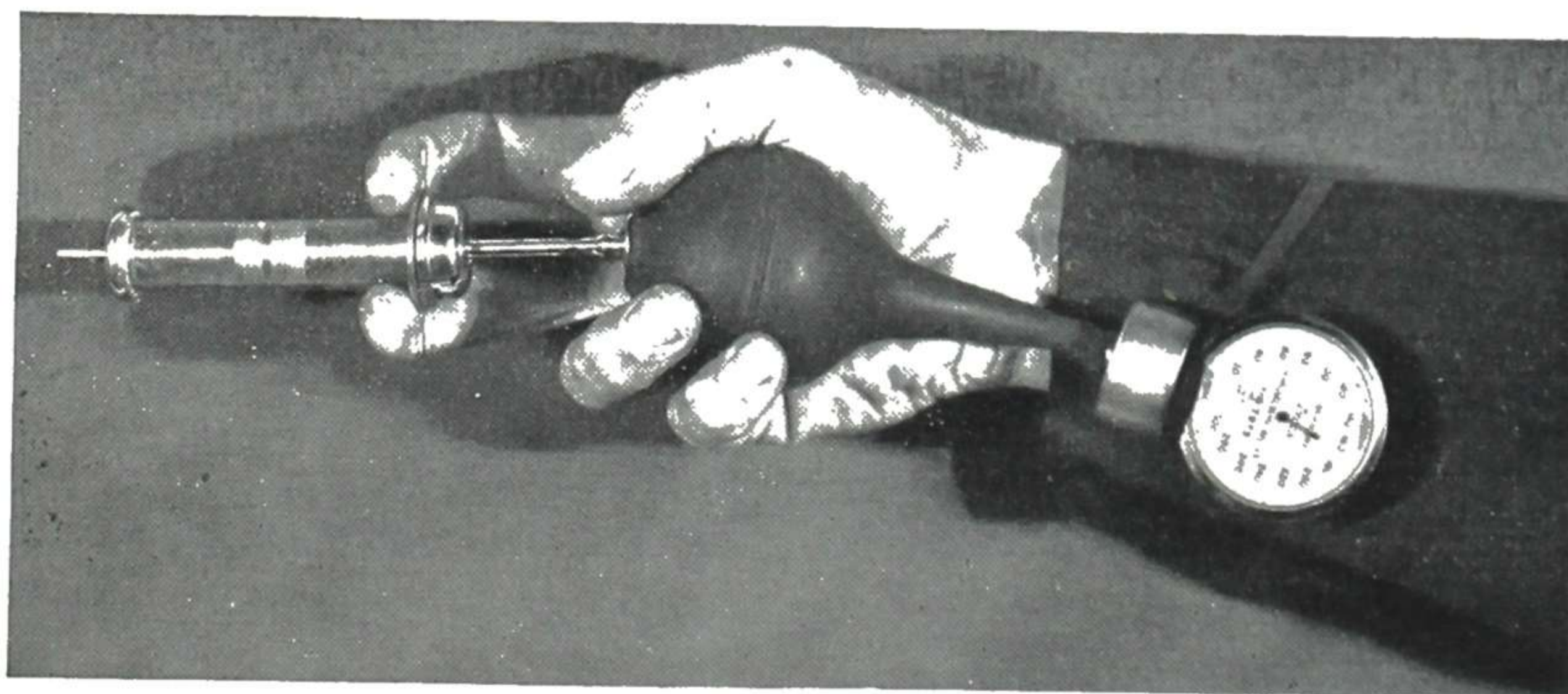


Fig. 232.—A simple method of measuring the pressure under which Lipiodol is introduced into the uterus. Pressure is made against the plunger of the syringe with an ear bulb attached to a Tycos manometer. (From Rubin: *Radiology.*)

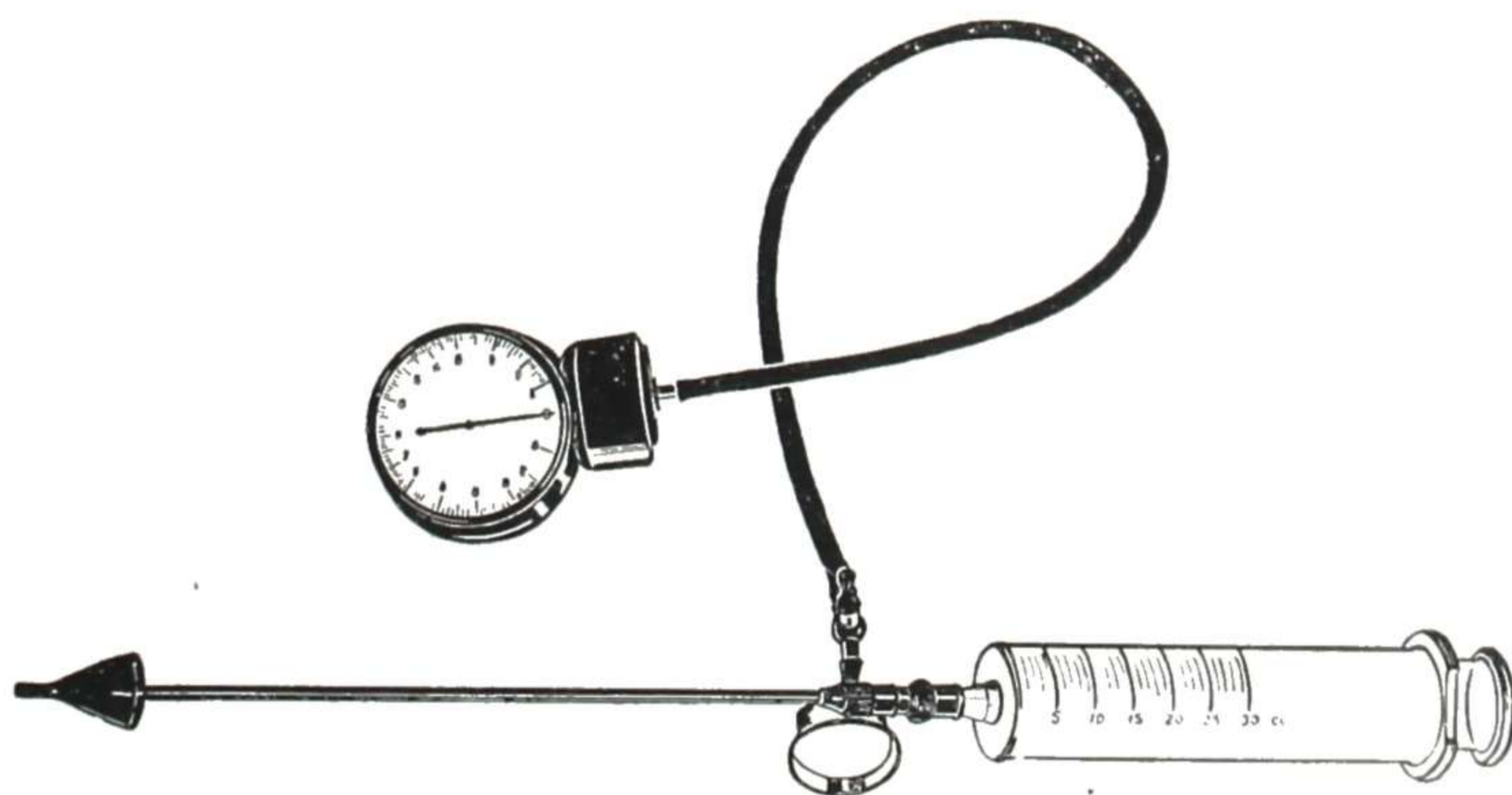


Fig. 233.—Jacoby instrument for tubal insufflation and uterosalpingography. (From Jacoby: *Am. J. Obst. & Gynec.*)

**Apparatus.**—The apparatus needed for the test is shown in Fig. 231. A specially arranged hand bulb and manometer, suggested by Rubin, are shown in Fig. 232; the Weisman apparatus may also be used. This addition gives

accurate knowledge of the pressure used during injection and enables one to avoid the danger of exerting excessive pressure when the tubes are closed. Jacoby uses the apparatus shown in Fig. 233. A short-tipped cannula should be employed so that the cervical and lower uterine canal can be visualized and submucous myomas diagnosed.

The technique of injection is as follows: A suitable antiseptic is applied to the cervix and cervical canal. A short-tipped cannula adapted for use on a 10 c.c. syringe is employed. Ten cubic centimeters of the contrast medium are drawn into the syringe and the cannula is fitted onto it. The cervix is then grasped with a tenaculum forceps, and, with the rubber cork tight against the cervix, the solution is slowly injected.

The injection is under controlled pressure, so as to avoid rupture of a tube. The simplest method is to press on the plunger with the rubber bulb attached to the sphygmomanometer, as in Fig. 232. A simple system is shown in Fig. 233. The exposure is made as soon as the solution has been injected. The cannula is then withdrawn. Hyams suggested taking films after successive injections of 2 c.c. He finds that the patient has less pain with this method, and it also helps to localize the filling-defects from myomas.

**Interpretation.**—In the interpretation of the x-rays it must be kept in mind that the tube cavity does not fill completely, or at least does not become distended, if the outer end is normally open. When the solution reaches the fimbriated extremity, it leaks into the peritoneal cavity; this leakage demonstrates the patency of the tube. The quantity injected should be adequate to cause sufficient leakage for x-ray demonstration but not enough to obscure the picture. If the tubes are closed, the solution fills the tubal cavity proximal to the point of block. The portion of the tube proximal to the block is usually distended, giving a clear-cut, blunt, rounded outline.

If the block is in the isthmus, there is no filling of the tube distal to the uterus. If there is doubt as to whether the solution has escaped into the peritoneal cavity, a simple x-ray taken from three to four hours later will show the mottled distribution of the solution throughout the pelvis. Small constrictions at the cornua of the uterus denote the sphincter muscles located at these points. The Lipiodol remains in the pelvis from two to three months and may lead to errors later in x-ray examination for other conditions. Salpingograms and hystero-grams are shown in Figs. 234 to 237.

**Dangers.**—As the use of iodized oil increased, the reports on undesirable results likewise increased. There have been at least eleven cases reported in which the oil accidentally entered the pelvic veins, and there are probably many more that have not been recorded in the literature. In an unreported case of ours, the patient experienced a chill and became faint during the injection, but within an hour she felt well enough to go home. The following day her sclera and skin turned a pale yellow and her temperature rose to 103° F., and she had a chill. Because the patient had had frequent attacks of malaria, a blood smear was searched for parasites, but none was found. The patient was merely observed and kept at rest in bed until the temperature returned to normal. There has been no subsequent disturbance. There have been a few cases reported of oil embolism in the lung. Fig. 238 shows a case repre-

sented by Roblee and Moore. Although patients usually recover from intravenous injections of these oily substances, severe reactions do occur; hence, as mentioned above, we prefer aqueous solutions.



Fig. 234.—Visualization with iodized oil. This case also presents normal tubes and a more nearly normal uterine cavity. There is a quantity of escaped fluid at the outer end of each tube, sufficient to give a clear demonstration. Gyn. Service. (From Newell: *Am. J. Obst. & Gynec.*)

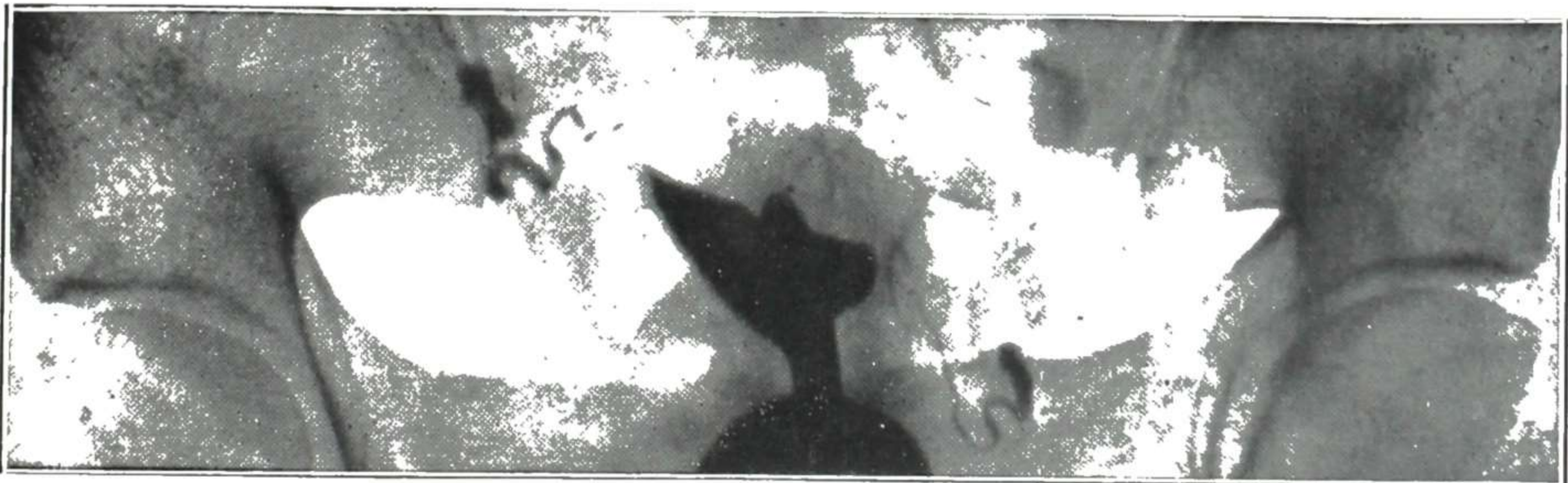


Fig. 235.—Visualization with iodized oil. In this case the right tube was open, as demonstrated by escaped fluid. The left tube was closed at the outer end, as demonstrated by the distention of the ampullar cavity. These findings were confirmed at operation. When the sealed tube was incised, the dark fluid escaped. A portion of the fluid ran out of the uterine cavity before the picture was taken, hence the upper part of the cavity does not show. Gyn. Service. (From Newell: *Am. J. Obst. & Gynec.*)

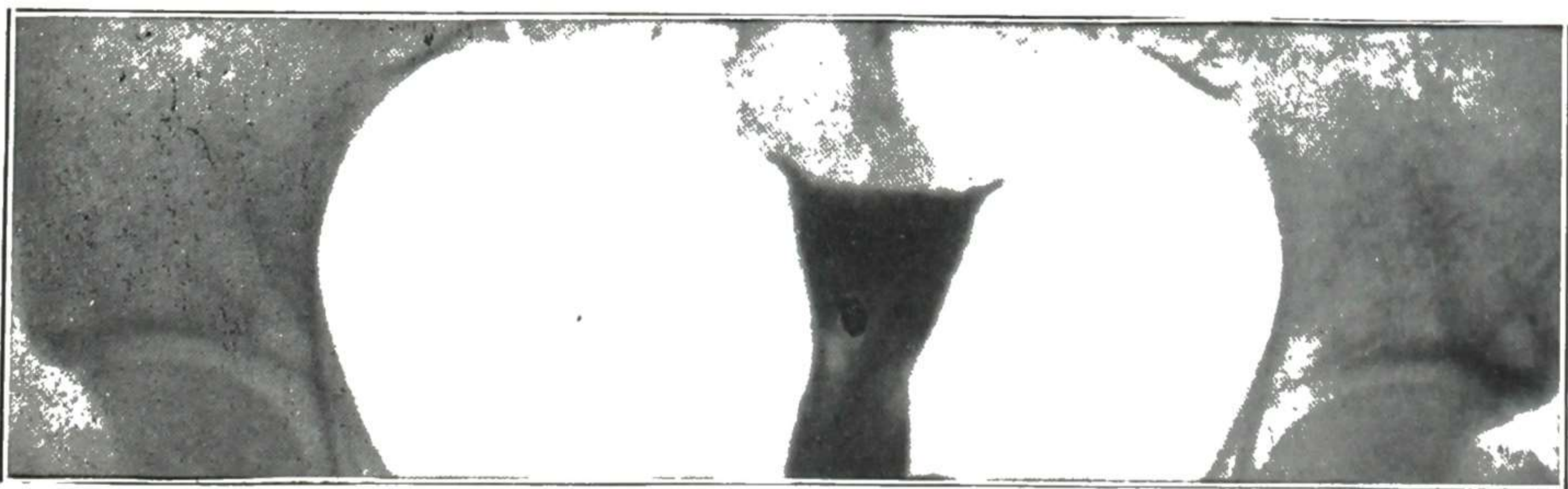


Fig. 236.—Visualization with iodized oil. In this patient the plate shows that each tube is occluded in its uterine portion, thus demonstrating at once the uselessness of operation for opening the tubes in this case. Gyn. Service. (From Newell: *Am. J. Obst. & Gynec.*)

Another contraindication to the use of oil is its irritating effect on the peritoneum in certain cases. Early in our use of Lipiodol we had a case of pelvic abscess which necessitated drainage. Numerous cases of this have since been reported, with several deaths. Lash described pelvic cysts following the use of lipids, and Rubin has described the foreign body giant cell reaction

which resembles that seen in tuberculosis. In normal tubes the reaction is slight but in abnormal tubes where the oil stays in contact over a long period of time, the reaction is marked. Recently Bang reported 16 cases of gynecologic infection following the use of oil in 900 hysterosalpingograms.

These facts emphasize the importance of a careful elimination of contraindications before using the test, and warn against its use where the simpler gas test will suffice, as in determining tubal patency. In a case in which the gas test shows tubal occlusion, hysterosalpingography is indicated to show the location of the occlusion. The importance of this localization, upon which turns the possibility or advisability of relief from operation, is sufficient to justify the additional risk.



Fig. 237.—Visualization with iodized oil. This is a plate from the case mentioned in the text in which the patient introduced a bent hatpin to produce an abortion. Notice that the uterine cavity is normal, showing no pregnancy. The tubes appear normal, each being open throughout, as demonstrated by the escaped fluid from each. The wound-canal through the uterine wall, made by the thrusts of the large pin, is well visualized by the opaque fluid. The injection of the iodized oil demonstrated clearly that the long pin was entirely outside the uterine cavity. *Gyn. Service.* (From Newell: *Am. J. Obst & Gynec.*)

The improvement in contrast media used, particularly the change from oil solutions to water solutions, has eliminated most of the dangers from the procedure, but not all, for Dolan reported an allergic death from Diodrast.

Prendergrass and his associates found in a compilation of 661,800 urograms 26 deaths in addition to the 11 which had already been reported in the literature. Ten of the deaths were immediate and could be attributed to

Diodrast, which was used as the contrast medium. All of these patients exhibited symptoms of anaphylactic shock. In order to avoid this serious drawback to the use of Diodrast, several simple tests have been suggested. Dolan has the patient hold 1 to 2 c.c. of the solution in the mouth for ten minutes, then if there is no reaction (numbness of mouth and face) the solution is swallowed, and if there is still no reaction (pallor, signs of shock, wheals, nausea), the usual intravenous injection is made. Naterman and Robins do an intradermal test using 0.05 c.c. of Diodrast; if the reaction after fifteen minutes shows a wheal larger than 15 mm., the test is strongly positive. Archer and Harris test by placing a drop of the dye in one eye. The eye is closed and is re-examined in one minute and a half and again in two minutes and compared to the other eye. If the vessels of the sclera and conjunctiva are injected from the iris to the periphery, intravenous injection is absolutely contraindicated.

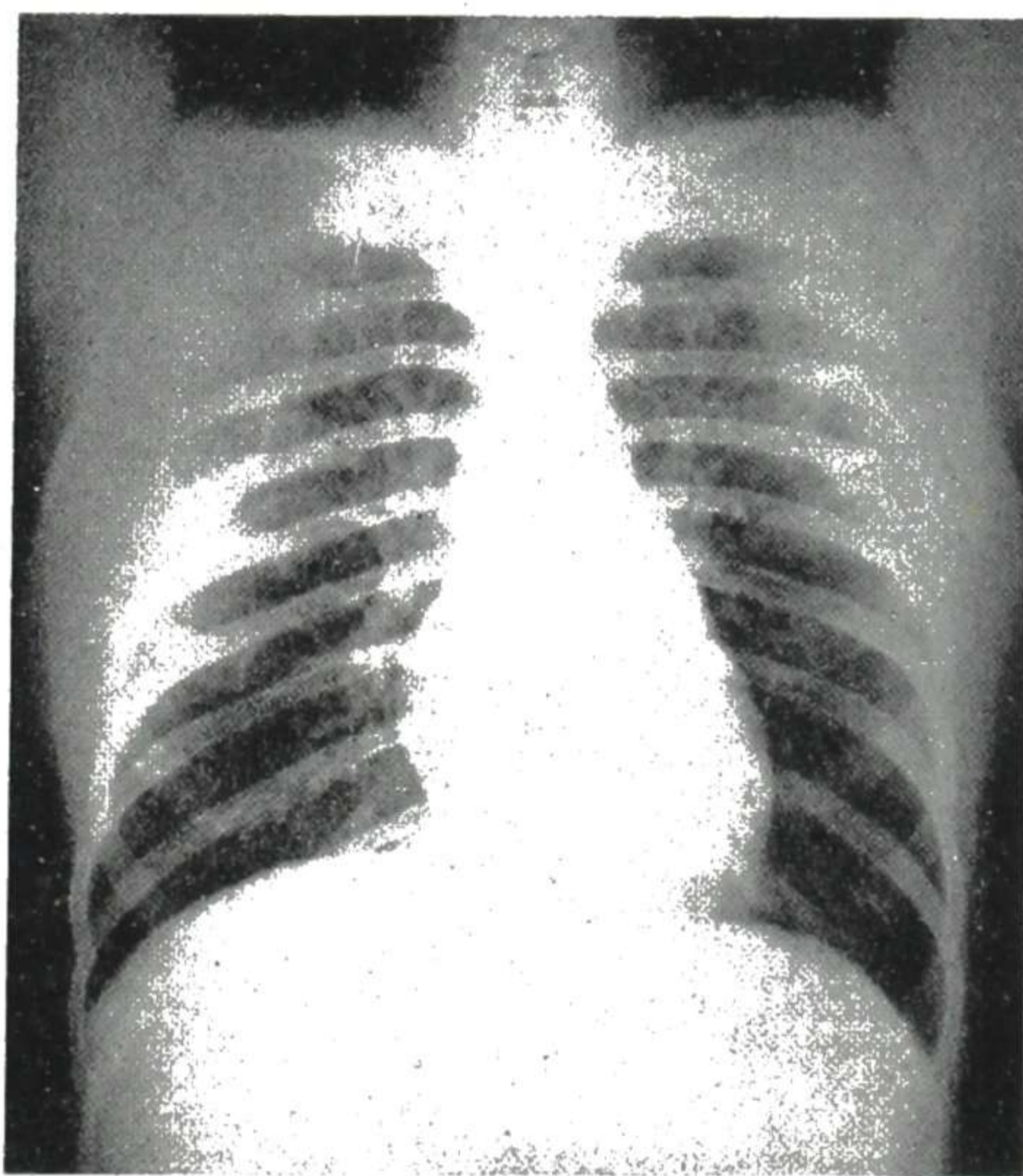


Fig. 238.—Chest film taken within twenty minutes after pelvic angiogram, showing the entire pattern of the bronchiovascular tree. Lipiodol used as contrast medium. (From Roblee and Moore: *South. M. J.*, February, 1945.)

A method of testing tubal pregnancy without the use of x-ray was reported by Speck. Phenolsulfonphthalein (P.S.P.) is injected into the uterine cavity and in thirty minutes the bladder is catheterized and the amount absorbed by the peritoneum and secreted by the kidneys is determined in the usual way for P.S.P. test. This test, though simple, does not give the same accurate information as does the Rubin test. Rosset feels that its usage is limited because of the indefinite end point and also the ability of some blocked tubes to absorb the P.S.P. solution; a similar conclusion was reached by Davis et al. in a recent series.

A study of the uterine cavity outlined by injection of opaque media has been advocated by some as an aid in the diagnosis of various intracavity lesions including submucous fibroids, polyps, pregnancy, intrauterine and extrauterine, and even in carcinoma. Fig. 239 is from an article by Rubin.

The technique is usually similar to that described under hysterosalpingography, though a different technique using an intrauterine rubber bag to contain the opaque medium is suggested by Norment. The value of hystero-gram in obscure cases of uterine bleeding is emphasized by Wexler and his associates. In 104 cases of obscure bleeding the pathologic cause of the bleeding was determined in 75 per cent of the cases by hystero-gram. Reenkola recently reported its use in determining the position and configuration of the uterus and found it an advantage in diagnosing infantile types of uteri as well as valuable in determining congenital abnormalities of the uterus.

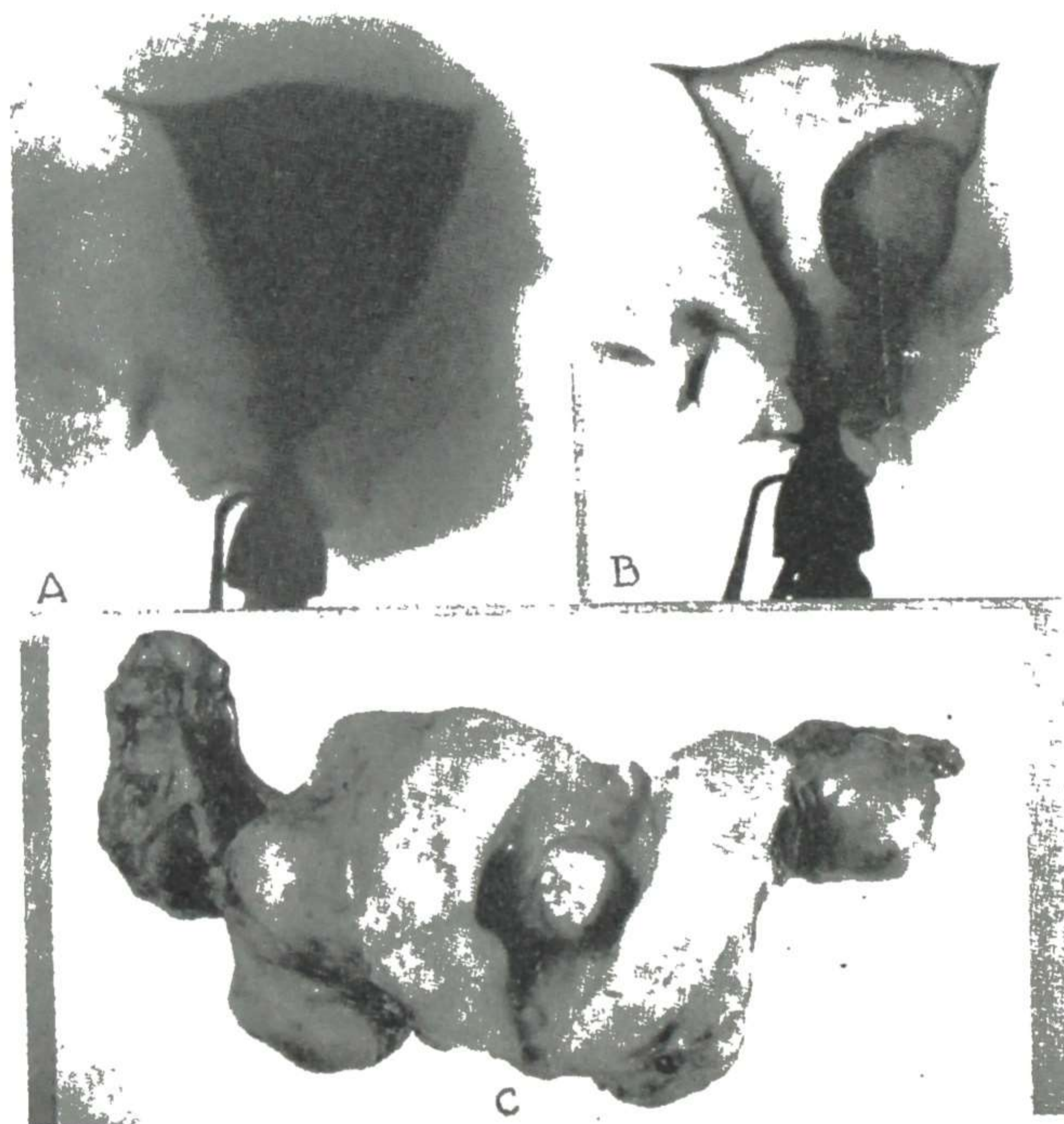


Fig. 239.—A, Hystero-gram with Hippuran 100 per cent solution shows a dilated uterine cavity but no marked suggestion of the presence of a submucous myoma. B, Hysteroaero-gram with carbon dioxide injected after Hippuran shows a solitary submucous fibroid, which may be seen in C. C, Uterus cut open showing a solitary submucous fibroid, visualized in B. (From Rubin: *Am. J. Obst. & Gynec.*, January, 1939.)

In 1921 Peterson and van Zwaluwenburg proposed injecting additional gas into the peritoneal cavity during hysterosalpingograph so that the intrapelvic organs could be visualized on the x-ray film. When the tubes are blocked or pregnancy suspected, transabdominal inflation is done. They felt that this pneumoroentgenography was an accurate aid in obstetric and gynecologic diagnosis. Irving Stein has been one of the greatest proponents for this procedure and he proposed the use of the term gynecography. He and his associates combined the use of pneumoperitoneum with hysterosalpingography and designate this as complete gynecography. Fig. 240 is from an article by Gershon-Cohen and Hermel, and Fig. 241 is from Stein's article. They have certainly proved beyond doubt that this can be a valuable aid in

determining with great accuracy the conditions in the pelvis. Its chief value is in sterility cases as a preliminary study where operative correction of occluded tubes is anticipated, and in gynecologic and obstetric cases where the diagnosis remains obscure in spite of the usual diagnostic procedures. Any nonoperative procedure which will aid in these difficult cases should be used if it can be shown to be safe. Stein, in twenty-five years of experience with the method, has found it to be both a safe and valuable diagnostic aid, and he feels that, as it is used more generally, fewer unwarranted laparotomies will be performed.

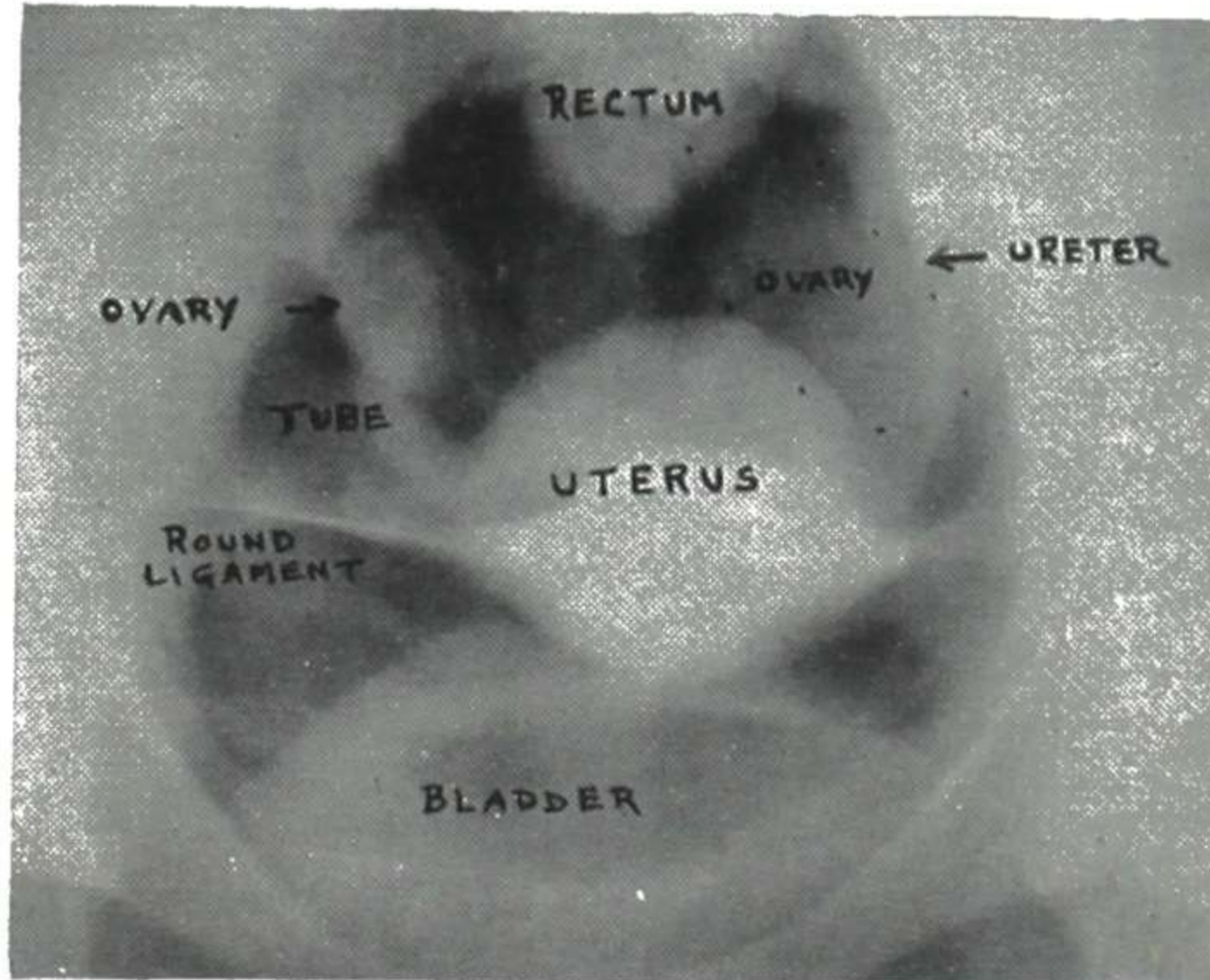


Fig. 240.—The x-ray appearance of the normal female pelvic organs with pneumoperitonium. (From Gershon-Cohen and Hermel: *Am. J. Obst. & Gynec.*, July, 1952.)

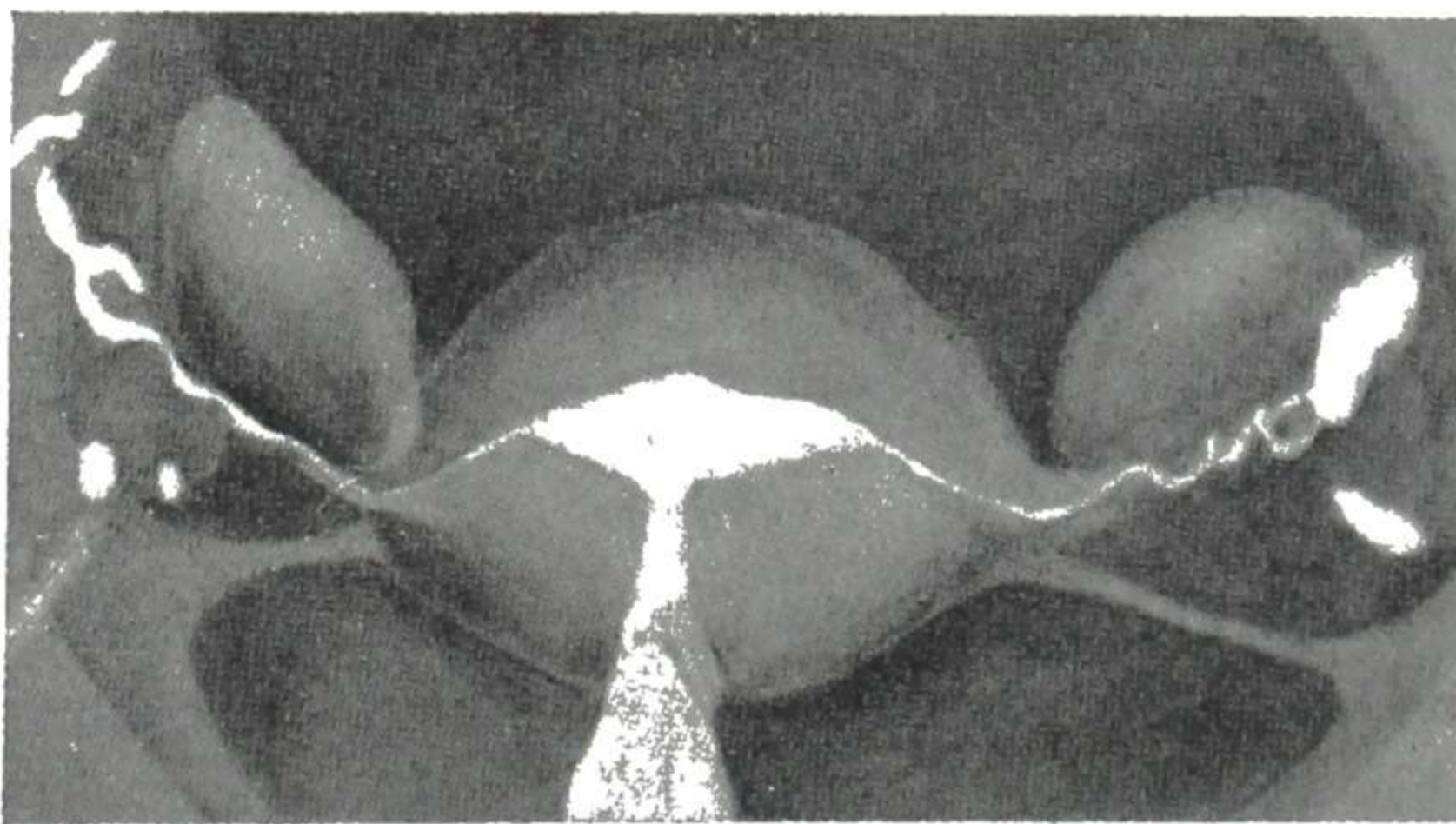


Fig. 241.—Complete gynecography. Sterility. Normal uterine and ovarian contours. Uterine cavity and tubes filled with opaque medium. Intraperitoneal spill. Normal genital status. (From Stein: *J. Mt. Sinai Hosp.*, September-October, 1947.)

### To Show Fetal Bone Shadows

After the fetal bones have formed, the bone shadows as shown by x-ray examination may be used as an aid in differential diagnosis in obscure cases. Positive bone-shadow x-ray evidences of pregnancy usually do not appear until four and a half to five months after conception, though with proper technique they can occasionally be seen earlier. Keeping this limitation in mind, ordinary x-ray examination may be helpful in differential diagnosis.

Calcified myomas and dermoids of the ovary are usually visualized by x-ray as are some stones in the genitourinary tract and bone metastases. X-ray of the skull gives indirect information on the pituitary gland by showing the

size and shape of the sella turcica and it also enables one to diagnose exostoses on the inner table of the skull found in certain endocrine dyscrasias. Sherwood Moore called attention to this condition of hyperostosis frontalis interna, in 1935 (Fig. 242), and in 1952 Moore and Carr reported two contrasting cases, one of which had been seen for twenty-two years.

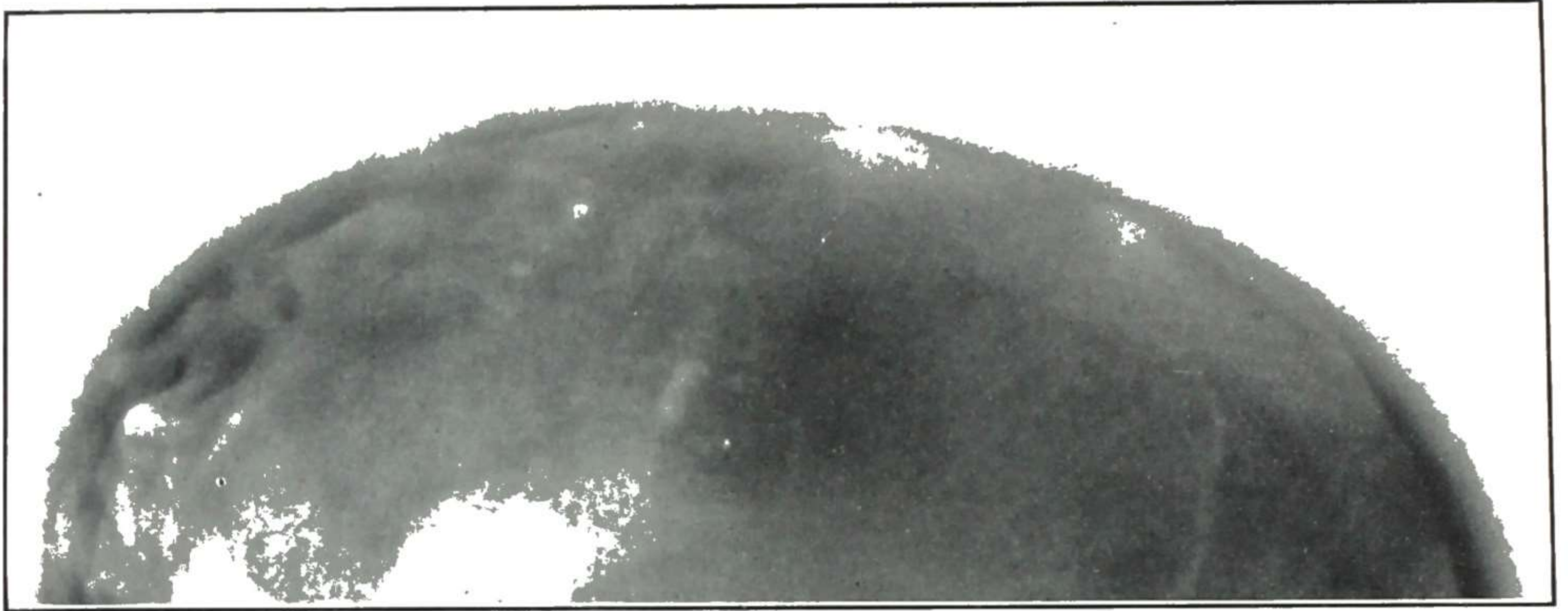


Fig. 242.—Exostoses frontalis interna. This condition, described by Dr. Sherwood Moore, consists of exostoses on the inner table of the skull. In this roentgenogram the exostoses are seen at the left edge of the figure on the inner table in the frontal area. (From Moore: *Am. J. Roentgenol.*)

### PELVIC EXAMINATION UNDER ANESTHESIA

The advantage of anesthesia is that it eliminates *pain* and *muscular tension*, the two factors that make the ordinary pelvic examination incomplete and unsatisfactory in certain cases. It must, however, always be remembered that pain and muscle guard are protective mechanisms and that when the patient is under anesthesia this protection is lost; hence, the examiner, even if extremely careful, may rupture an early ectopic pregnancy or acute abscess. For this reason when an ectopic is suspected, one should be prepared to do immediate abdominal operation, and adequate matched blood for transfusion should be on hand.

**Preparations.**—In preparation for this examination the patient's bowels should be moved with a purgative on the previous day and the rectum should be cleared out with an enema some hours before the examination. The same preparatory examination of the heart, lungs, and urine should be made as though anesthesia were for an operation. Have ready a light, strong tenaculum forceps, so that the cervix may be caught and the uterus pulled down as desired. If the interior of the uterus is to be explored, the antiseptic preparation for curettage must be carried out and the instruments prepared.

**Examination Methods.**—The principal manipulations employed in examination under anesthesia are as follows:

1. Bimanual palpation of pelvic interior.  
Vaginoabdominal palpation.  
Rectoabdominal palpation.
2. Uterine investigation.  
Curettage.  
Conization or biopsy of cervix for specimens.



**Vaginoabdominal Palpation.**—Bimanual examination under anesthesia is carried out as outlined under regular examination. In cases of doubtful or obscure masses it permits deep palpation as resistance is eliminated.

**Rectoabdominal Palpation.**—Rectal examination gives an opportunity of further outlining masses and determining more accurately the extent of parametrial infiltration for the purpose of classification in cervical carcinoma cases. Rectovaginoabdominal examination is especially helpful in determining masses or infiltration in the posterior vaginal wall and rectovaginal septum. By catching the cervix with a tenaculum forceps and pulling the uterus downward, the posterior surface of the uterus and the ovaries and the broad ligaments may be palpated with but little intervening tissue.

**Curettage.**—Regular curettage under anesthesia combines with its diagnostic value a decided therapeutic effect, for it removes the diseased endometrium and diminishes bleeding and discharge.

If a small lesion is present in an otherwise normal cervix, a biopsy is done, but if there is definite cervicitis present, a small or a wide conization is preferable to an isolated biopsy as it removes the irritated area and gives all the tissue at the epithelial junction for microscopic examination.

If there should be any suspicion of carcinoma high in the cervical canal, curette the canal and put the curettings in a separate bottle.

**COLLECTING CURETTINGS.**—In a diagnostic curettage, observe the following points, which assist the pathologist in his work:

1. Put citrate solution (2 per cent sodium citrate) in the vagina, and keep adding more citrate solution to prevent clotting on the specimens.

2. Remove the endometrium from all parts of the uterine cavity, so that no small area of carcinoma could be missed.

3. Put all the curettings directly into a basin containing citrate solution. It is preferable to wash them out of the vagina with the citrate solution, so as to avoid handling.

4. Pour the solution containing the fragments through gauze, and then transfer all the tissue fragments, without compression, to a small bottle containing 10 per cent formol, and send to the laboratory. If no formol is at hand, 95 per cent alcohol may be used.

5. If the pathologist is in a distant city, the little bottle should be corked securely and put in a mailing tube or wrapped with cotton and otherwise packed securely for safe transmission.

6. With the specimen, send a note stating the nature of the specimen (curettings from within uterus), when obtained, name and age of patient, and some of the important facts in the history of the case. Always give the date of the last menstruation, as the phase of the menstrual cycle at which the specimen is removed has an important bearing on the differential diagnosis in many cases.

### **INTRA-ABDOMINAL INSPECTION**

When the ordinary methods of pelvic examination fail to furnish sufficient information for a diagnosis which is urgent, intra-abdominal inspection is to be considered. Such inspection may be accomplished by culdoscopy or through a puncture of the abdominal wall and the use of a specially designed endoscope or through the regular laparotomy incision.

**Culdoscopy.**—Much work has been done on developing a practical instrument and technique for peritoneoscopy. Ruddock was a pioneer in this field. In 1947 Decker adapted endoscopic visualization to use in pelvic diagnosis by the vaginal route and called this procedure culdoscopy.

**EQUIPMENT.**—The equipment necessary as outlined by Decker is as follows: a Decker culdoscope, a special trochar and cannula for puncturing the cul-de-sac, a modified Colvin type self-retaining cervical tip with a special flexible cannula, a perineal retractor, a curved volsellum, a 20 c.c. syringe, and thigh straps.

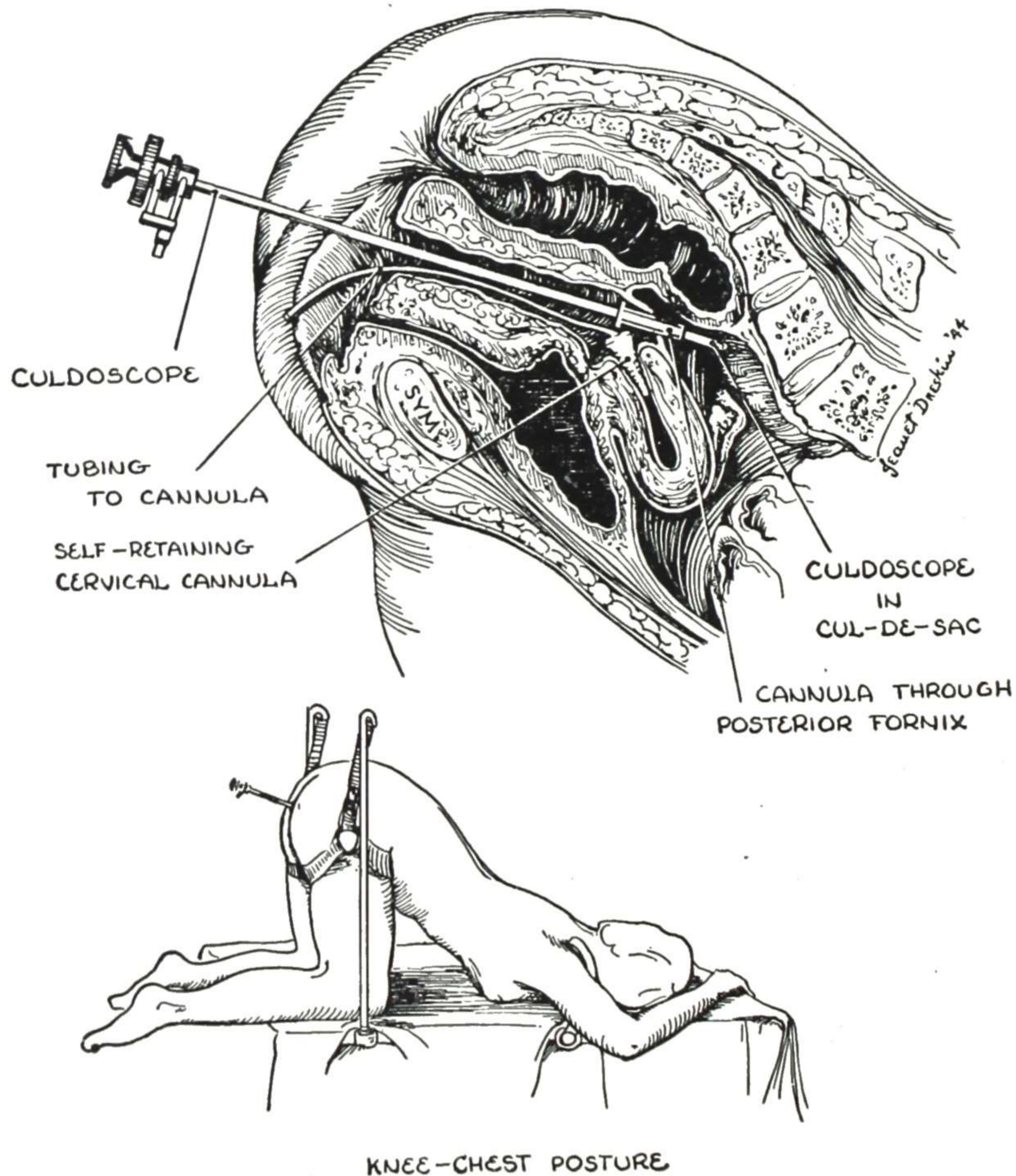


Fig. 243.—The culdoscope is shown in the cul-de-sac, and the screw tip cervical cannula is in the cervical canal. The lower figure illustrates the proper method to maintain the knee-chest posture. (From Decker and Cherry: *Am. J. Surg.*, April, 1944.)

**TECHNIQUE.**—The patient is placed in the knee-chest position as shown in Fig. 243. The perineum is elevated with a Sims speculum, and if local anesthesia is to be used the cervix is grasped with a curved volsellum and drawn down. The vaginal vault nearest the cul-de-sac (posterior vault) is infiltrated with about 10 c.c. of 1 per cent Novocain solution or 5 c.c. of 2 per cent procaine hydrochloride. The self-retaining cervical tip on a flexible cannula is then screwed into the cervical canal. Next the trochar and its cannula are thrust through the vault of the vagina into the cul-de-sac and an inrush of air confirms successful entrance. Inspection of the pelvic organs is then carried out

by inserting the endoscope through the cannula. If desired a dye may be injected to test the tubal patency, and if the tubes are closed it helps to identify the region of the obstruction. After the examination the cannula in the vault is left in place until the air has been forced out of the abdomen by placing the patient on her abdomen with a pillow under the abdomen and the head of the table lowered. A bag containing carbon dioxide may be used instead of air by attaching a bag of carbon dioxide to the valve in the cannula. It is not necessary to remove the carbon dioxide after the procedure.\*

**Peritoneoscopy.**—This procedure is particularly useful in upper abdominal conditions where satisfactory internal palpation cannot be carried out, as it usually can in the pelvis (Fig. 244). When under consideration in any case the advantages and disadvantages should be carefully compared with those of abdominal incision.

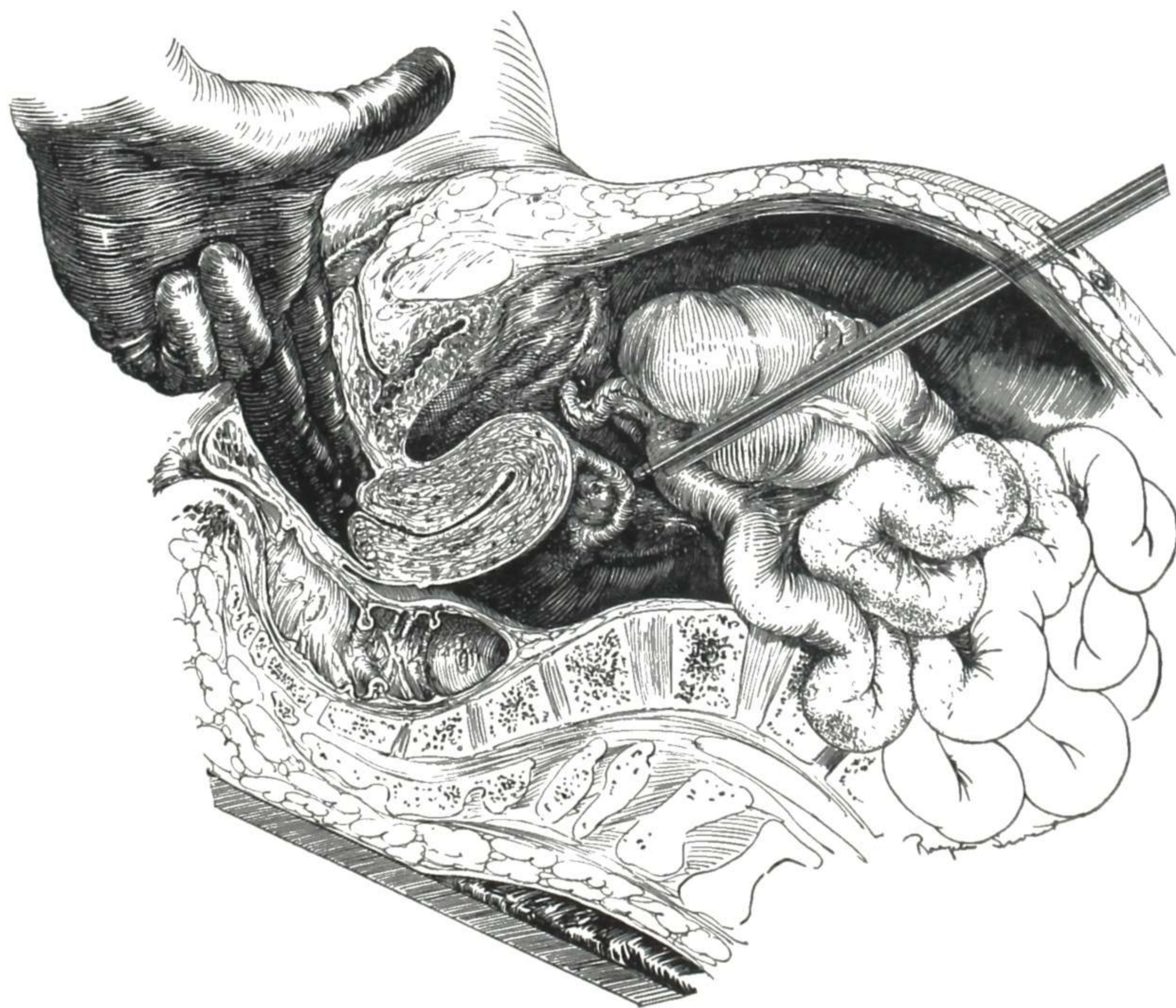


Fig. 244.—Peritoneoscopy, with a special endoscopic tube and pneumoperitoneum. The pelvic structures may be moved by fingers in the vagina to bring different parts into view. (From Ruddock: Surg., Gynec. & Obst.)

**Through Incision.**—Abdominal incision permits thorough inspection of different sides of a growth, and in addition allows palpation of the lesion, breaking of adhesions, detailed exploration to determine definitely whether or not it is removable, and removal if such is found feasible. When finished, the surgeon knows definitely the character of the mass and whether or not it is removable, and, if so, it has been removed. If not removed, the family knows beyond a doubt that it is irremovable and that no further operative work is advisable. The decisive thing in choosing between culdoscopy or peritoneoscopy and regular incision is not simply how much can be seen through a tube

\*For details on findings and interpretation of findings consult a recent article by Decker, J. A. M. A., May 28, 1949.

in a puncture-wound but which procedure will be most beneficial to the patient when everything is considered.

Exploratory culdotomy with direct inspection of the ovaries and tubes has been advocated by Doyle.

### URINARY TRACT INVESTIGATION

The close association of the urinary tract with the genital tract may cause misinterpretation of symptoms, the symptoms of one being attributed to the other; for example, the common complaint of pressure or fullness about the vagina or uterus is often due to a mild cystitis, urethritis, or trigonitis. This fact must be kept in mind, particularly in those cases where the patient insists that there is real discomfort in this region after examination shows no genital lesion to account for it.

Inquiry as to urinary function will often reveal some symptom indicating that the location of the trouble is in the urinary tract. Symptoms such as urgency, frequency, pain after urination, or occasional leakage on coughing or sudden exertion would indicate trouble in the bladder or urethra and hence need for cystoscopic examination.

Pelvic pains supposedly from the genital tract are occasionally due to ureteral stricture or stone. Huhner has emphasized the frequent association of intractable dysmenorrhea with ureteral stricture. A stone in the lower third of the ureter may cause a tender area simulating a parametritis or salpingo-oophoritis.

Where upper urinary tract involvement is suspected, intravenous pyelograms may reveal the lesion, or it may be necessary to do retrograde pyelograms with ureteral catheterization. A cystogram helps in the diagnosis of stone, foreign body, or diverticulum. Urethral diverticulae are diagnosed by noting a discharge of urine or pus from the meatus, after the bladder has been emptied, when pressure is made along the urethra with the examining finger. Exact location of the pocket is made by means of a probe or urethroscopy.

### PREMARITAL EXAMINATION

The premarital examinations required by law are primarily to exclude syphilis and gonorrhoea. The exact requirements vary somewhat in different states. Detailed information and the forms to be filled out may be obtained from the State Health Department.

In addition to the designated legal requirements, the patient wishes to know, of course, if there is anything that would interfere with marital life. In such conference, one practical point is to avoid disturbing the patient's happy mood by attaching undue importance to certain findings—such as uterine retrodisplacement without symptoms, erosion of cervix, small fibroid, cystic ovary, or other local variation from the usual that may not cause trouble. It is usually best to tell the patient that there is a slight variation from the usual findings which may need observation or possible local treatment later, but assure her that it will in no way interfere with successful marriage or childbearing. If the hymenal opening is so small as to preclude coitus except with severe trauma, it is advisable to enlarge the opening. This

can usually be accomplished by having the patient use graduated dilators, but if the hymen is very thick, dilatation under short general anesthesia is preferable.

The premarital conference is now recognized as an important means of aiding the young couple toward a successful married life by helping them to avoid the marital tragedies which often have their origin in small misunderstandings, lack of knowledge, or initial physical or psychic trauma. Unfortunately our profession has been slow to recognize the importance of premarital conferences. We advocate aptitude tests for our young people to determine their fitness for various occupations and yet we have been slow to recognize the importance of a similar examination for the most vital occupation in life—marriage and parenthood. The need for it has been forcibly impressed upon us by the end results of its omission, namely, marital maladjustment, frustration, divorce, and psychosomatic problems. Formerly many of our young people came to marriage handicapped by all sorts of taboos, inhibitions, fears, and anxieties, but in recent years many of our high schools and colleges have offered courses on preparation for marriage. Numerous books dealing with marriage are on the market, so that general information on the subject is available.

The physician should be prepared to give wise premarital counsel which will help the couple to start their marriage with a sense of security that they would not otherwise have. This confidential contact with the young couple will usually make them feel free to return promptly for intelligent advice if new problems or conflicts arise rather than delay until irreparable damage has occurred.

Contraceptive advice is often requested, and this request opens the way for a discussion of its advisability or otherwise in the particular case. It is well to keep in mind that contraceptive measures were developed for use in two definite situations: first, for patients with serious disease in whom a pregnancy would endanger life, and, second, for mothers having babies so frequently that there is no opportunity for recuperation between pregnancies. In this latter group its purpose was not contraception but child-spacing or planned parenthood. In recent years it has been used in early marriage to permit time for marital adjustment before introducing a potentially disturbing third party.

With the many psychological and physical adjustments required by the new intimacy of marriage, the additional problem of an immediate pregnancy with its attendant uncertain symptoms and psychic reactions may be a deciding factor in causing a permanent maladjustment or divorce. For these reasons it is usually well to advise some type of contraception during the time necessary to make the needed adjustments, the method being determined by the patient's wishes. It is also important to inform the couple of the dangers of delaying parenthood too long. Rubin reported a large series of sterility cases in which the patients had practiced contraception during their most fertile years; then, when they finally decided to start their families, they discovered that the years which should have been spent treating the unsuspected sterility had been lost. Meigs has recently pointed out that endometriosis is not as common in women who have had their babies early in their married

life as it is in those who have postponed motherhood for years. When endometriosis or other conditions known to be associated with sterility are discovered at the premarital examination, the couple should be advised to start their family as soon as possible.

The methods of contraception vary: Catholics usually prefer the "safe period"; others prefer the condom or the diaphragm. It is usually best to recommend the use of the condom until after the honeymoon; then a diaphragm can be more accurately fitted. In some cases the diaphragm can be fitted prior to marriage.

The technique of fitting the diaphragm is as follows: various sizes of fitting rings are tested in the vagina and the one which fits snugly behind the symphysis pubis when the inner portion of the ring is in the posterior fornix is the proper size to use. The patient is then shown how to place the diaphragm on the director and insert it into the vagina. She then repeats the process herself to be sure that she understands it. The dome of the diaphragm is toward the patient and the contraceptive jelly is placed on the dome and around the rim of the diaphragm. After coitus there should be an interval of at least six hours before douching. One half of the douche is then taken before removal of the diaphragm and the rest of the douche after removal. A douche consisting of a tablespoon of white vinegar to a quart of water is satisfactory.

## DIFFERENTIAL DIAGNOSIS

The ultimate purpose of an accurate history and a careful examination is to establish a diagnosis. All too frequently authors spend a great deal of time on the methods of acquiring the necessary facts and then completely neglect to elucidate on the method by which these facts should be utilized in the important process of making a diagnosis. Eventually, through years of experience, one acquires his own particular system of ferreting out and assembling the pertinent facts needed to reach a conclusion. A brief summary of some of the general principles we have found useful in the fascinating art of diagnosis will, we hope, be helpful to others.

## METHOD IN DIAGNOSIS

Accurate and prompt diagnosis is much facilitated by a **grouping of diseases under certain prominent symptoms**. This is the natural method, the one that is followed unconsciously. The prominent sign or symptom in the case brings to mind a group of diseases, and then by the consideration of other ascertained facts, the diagnosis is narrowed down to one or two of these. This differentiation should be made as one proceeds with the examination. For example, suppose during an examination an ulcer is found on the external genitals. Immediately arises the question, "Is this a chancroidal or syphilitic or tuberculous or malignant or simple ulcer?" Endeavor to settle the question then and there. Recall the facts in the history bearing on the differential diagnosis. Notice the characteristics of the lesion. Is there lymphatic involvement and, if so, of what type? Are there in other parts of the body evidences of syphilis or tuberculosis?

Each important sign must be thus critically considered, and the habit of doing so should be cultivated. In a few cases the diagnosis is apparent from a few prominent facts, but in most cases, particularly in deep-seated and serious diseases, the diagnosis must be established by a **critical analysis** of the mass of information obtained in the history and examination. It is this critical analysis, this testing and elimination of diseases that do not stand the test, that makes the difference between the careful diagnosis and the snap diagnosis, between a reliable diagnostician and an unreliable one.

This effective application of the signs to the diagnosis should, as far as practicable, be **made promptly and rapidly**, as they are encountered in the examination. Though in a systematic history and examination all the important facts are supposed to be obtained, yet if the application of the symptoms to the diagnosis is made as one proceeds, certain points in the history of particular importance in the diagnosis in that case will be given the special attention which they require. Hence the importance of having in mind for immediate use the diagnostic significance of the common signs encountered.

### Consider Extragenital Conditions

Disturbing symptoms in the lower abdomen or back do not necessarily mean genital disease. The trouble may be in some other structure in that vicinity or elsewhere. In this connection we must consider the following structures:

**Digestive System**—Gastroenteritis, appendicitis, cecal tuberculosis or tumor, colitis, diverticulitis, proctitis, hemorrhoids, tumor of rectum or colon.

**Urinary System**—Urethritis, cystitis, bladder stone or tumor, pyelitis, ureteral stone or stricture, kidney stone or tumor.

**Skeletal System**—Arthritis of sacroiliac, sacrococcygeal, lumbar or lumbosacral joints, vertebral tuberculosis or tumor or injury, postural backache or occupational strain.

**Nervous System**—Tabetic crises, transverse myelitis, neuritis and neuralgia, hysteria or other psychosomatic disturbances.

It is not necessary to go into detail regarding the above conditions; to name them is sufficient to call attention to them for differential diagnosis. Most of the serious mistakes in diagnosis come not from ignorance of the symptoms of various diseases but from the fact that the missed disease **was simply not thought of** when deciding on the cause of the patient's symptoms.

### Grouping of Pelvic Symptoms

Having concluded from the brief preliminary questioning that the trouble is probably in the genital tract, the next step is to determine to what general group of pelvic disturbances this belongs. It is interesting to note that in nearly all cases of a distinct lesion the symptoms presented fall easily into one of two groups. One of these may be designated as the "inflammatory symptom-complex" and the other as the "new growth" set of symptoms.

The "inflammatory" group would include not only inflammation but also such conditions as tubal pregnancy, endometriosis, and tumor with a twisted

pedicle, for these conditions have many symptoms in common, such as sudden onset, sharp pain, tenderness on examination, and remissions or recurring attacks. The "new growth" symptoms would include gradual onset, dull pain or dragging sensation, absence of tenderness, and gradual increase in symptoms, and these would apply to a uterine or ovarian tumor, prolapse or other uterine displacement, or relaxed pelvic floor.

In complicated cases there may, of course, be a combination of conditions with consequent mixture of symptoms, but uncomplicated lesions usually drop readily into one or the other of these two symptomatic classes.

There are, however, gynecologic patients without any organic lesion. They constitute a third class—the "functional" group. The symptoms may simulate those of either class of lesions or they may be a mixture. The "functional group" includes endocrine and nutritional disorders, allergic manifestations, postural or occupational strain, and neurologic or psychosomatic disturbances. Appropriate additional information acquired from special examinations or tests will help to establish the diagnosis. In psychosomatic problems the diagnosis must sometimes be made by elimination of an organic lesion or other cause for the complaint. The suffering which these patients have is very real to them and though some will be relieved when assured in an intelligent way that there is no serious organic lesion present, others will merely seek further medical help until they end up having some one perform an unnecessary operation. In this latter type suggestive treatment with vitamins, iron, and mild nerve sedatives will frequently work wonders, much to the relief of the patient and doctor. In complex neurologic and psychiatric problems the patient should be advised to seek the proper consultant promptly.

### **Pitfalls in Diagnosis**

Before taking up the details of diagnosis, it is well to call attention to some of the pitfalls which the practitioner will encounter. Forewarning may put him on the alert and diminish the number of bitter surprises which come with experience. If gynecologic diseases always followed a typical course and the patient always picked out from her subjective disturbances the identifying ensemble of symptoms, gynecologic diagnosis would be easy work in which the tyro could proceed confidently and safely, and the experienced gynecologist would have to look elsewhere for the difficult problems and unexpected findings which give spice and interest and development to life. But there is no necessity of going elsewhere for difficult problems or stimulating surprises. Gynecologic diagnosis furnishes plenty and to spare, as every gynecologist can testify. It has been said that "the abdomen is the greatest surprise-box ever opened," and the pelvis portion of it is not the least disconcerting.

The particular diagnostic difficulties pertaining to each disease will be considered in the chapter dealing with that disease, but it may be helpful to call attention here to certain difficulties having a general bearing. Keeping these in mind constitutes a part of that diagnostic alertness or eternal vigilance which must be exercised in working safely through the maze of diseases and their combinations and associated conditions.



**Errors About the History.**—The information obtained from the patient occupies a large place in the diagnosis in most cases, and in some cases certain items are of decisive importance. The history, however, is largely a subjective matter, the “facts” as stated being the patient’s interpretation of recalled sensations which often were, even at the time, not clearly defined in content or origin. In addition, there are the suggestive and other psychic factors to be considered. Occasionally also there is attempt at deception, the patient endeavoring to build up a claim for damages for some alleged accident or pretending acquired disease as a cause for divorce or hoping for abortion from some instrumental examination or treatment.

**Errors About a Pelvic Mass.**—A common error is to interpret a mass as something which it is not. The nature of a pelvic mass must be determined *indirectly*. We cannot see it or touch it directly, except through the danger of peritoneal invasion. There are no sounds which identify it (except in late pregnancy or aneurysm). Our palpation of it must be through intervening tissues which may obscure its outlines or give a false impression as to its size and consistency. Attempts to overcome these difficulties have aided some, but they have not removed the necessity for trained palpation nor for gray-matter activity on the possible interpretations of what is felt. After preliminary instruction and practice in technique of examination under the guidance of a qualified teacher, repeated use of this knowledge in examining patients and interpreting pelvic findings is needed in order to acquire the “educated touch.” At every opportunity conditions found at operation or autopsy should be used to check the preoperative pelvic appraisal.

The *apparent size* of a mass under vaginoabdominal palpation depends a good deal on the thickness and consistency and tension of the intervening tissues, particularly the abdominal wall as indicated in Figs. 245 to 247. The *apparent consistency* may be misleading on account of the intervening tissues or on account of failure to palpate completely. The *apparent tenderness* of the uterus or other pelvic mass must be interpreted with caution. For example, when pressure on the cervix causes pain, do not jump to the conclusion that the cervix is tender. Consider other conditions which may cause pain when the cervix is moved or pressed on, such as those shown in Figs. 248 to 253. Again, tenderness may be due also to neuritis in the area. Remember also that pain is a subjective symptom which may be a referred psychic phenomenon or possibly a deliberate attempt to deceive.

**Facts and Assumptions.**—Owing to the hiatuses in our knowledge of deep-seated conditions in a patient even after a careful examination, some assumptions are usually necessary in making a diagnosis. For example, in palpating a pelvic mass there are some portions the outlines of which can be clearly felt and other portions the outlines of which cannot be felt. To complete the diagnosis we assume a certain approximate outline in the nonpalpable area, endeavoring to avoid error by careful interpretation of all the findings. The outline of the palpable portion represents a fact, while the outline of the nonpalpable portion represents an assumption. Unless constantly on guard we are likely to overlook the relative dependability of the two in working toward a conclusion. It is so easy to allow the probable to slip into the positive class, to be used later as a positive factor in deciding between diagnostic possi-

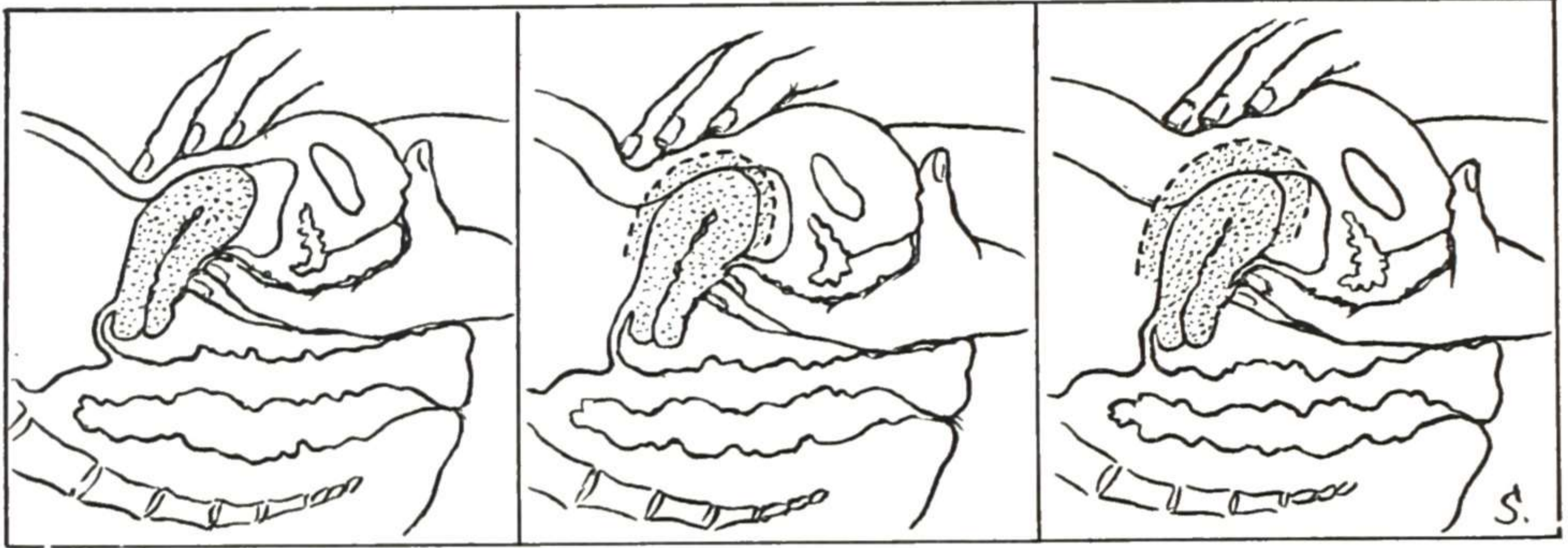


Fig. 245.

Fig. 246.

Fig. 247.

Figs. 245 to 247.—Error in estimating size of uterus may be caused by thick abdominal wall, particularly when wall is very thick, as in Fig. 247.

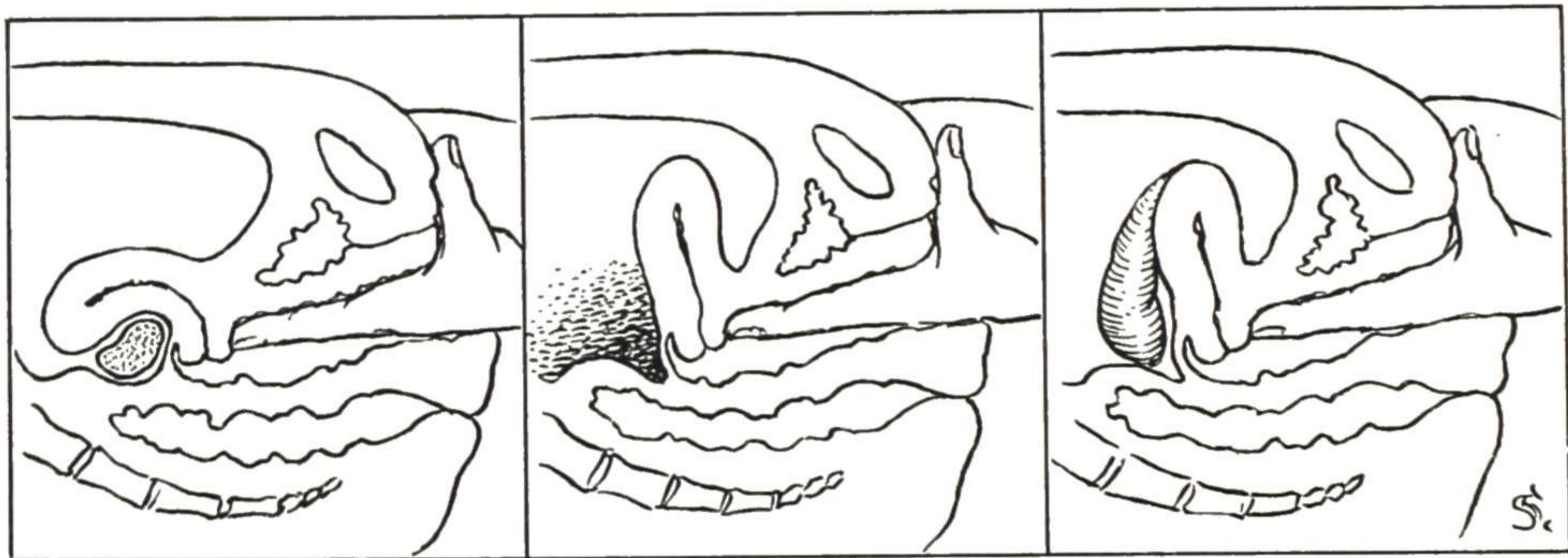


Fig. 248.

Fig. 249.

Fig. 250.

Figs. 248 to 250.—Various cul-de-sac conditions which may cause pain when cervix is pressed on. Fig. 248, Ovary under retrodisplaced uterus. Fig. 249, Inflammatory mass. Fig. 250, Tube, enlarged by inflammation and prolapsed.

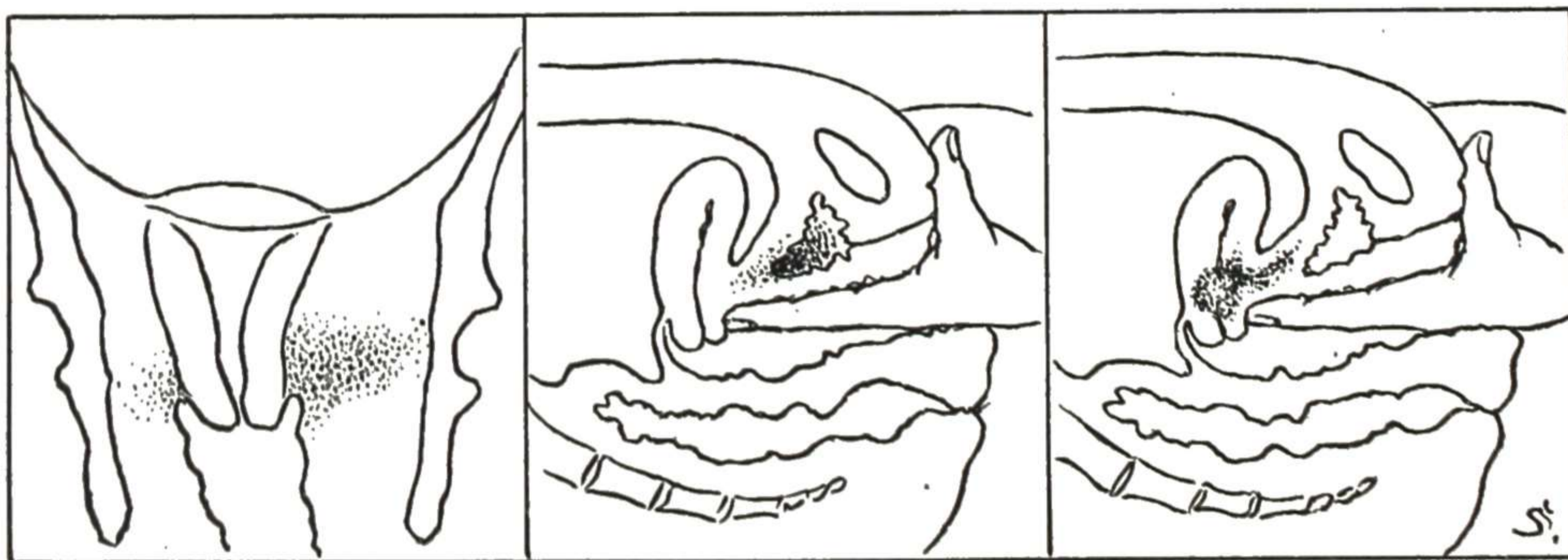


Fig. 251.

Fig. 252.

Fig. 253.

Figs. 251 to 253.—Other conditions causing pain when cervix is pressed on. Fig. 251, Parametritis. Fig. 252, Cystitis. Fig. 253, Uterine inflammation or cancer.

bilities, that this process not infrequently leads to a wide error in diagnosis. The reason for the error becomes apparent as one traces back from the operation-findings through the ways in which the erroneous diagnosis was reached, but it is better to recognize the pitfall before the fall-in.

**Errors About Tests.**—When by the history and pelvic examination the diagnosis has been narrowed down to two or three conditions, decisive differential diagnostic information may often be furnished by one of the various special tests. An important point to keep in mind, however, is that in many instances the diagnostic significance of the result of a laboratory test depends on the associated clinical findings. The test simply furnishes one item of information, and for use in clinical diagnosis this test-item must be correlated with the items obtained from the history and the examination. Even the test-item itself (the pathologist's interpretation of what he sees) may need to be varied with the clinical findings. Consequently, helpful coordination between the clinician and pathologist is necessary to avoid serious mistakes on each side.

**Ignoring Unaccounted-for Symptoms.**—Unaccounted-for symptoms and examination findings are danger signals one must learn to heed. The symptom or examination sign which will not fit into the otherwise satisfying diagnosis is an irritating nuisance to the careless diagnostician but a stimulating question mark to the careful one. An unaccounted-for symptom indicates that there is something still unknown about the case, and as long as its cause remains unknown it throws doubt on the correctness or completeness of the diagnosis. "A word to the wise is sufficient."

### Tenderness in Right Lower Abdomen

As an example of these methods in diagnosis, let us discuss the differential diagnosis of conditions causing pain and tenderness in the right lower quadrant. First we would consider the pelvic lesions and then other conditions which could account for the symptoms and signs.

In **pelvic conditions** one of the normal processes in which the pain may be severe enough to be confused with acute appendicitis is ovulation. McSweeney and Wood found that the percentage of appendicitis to ovulation in patients admitted to the Boston City Hospital because of right lower quadrant pain was one case of ovulation to thirteen of acute appendicitis. Pain with ovulation occurs halfway between the periods in women having a twenty-eight day cycle and is accompanied by other signs or symptoms of ovulation. In diseases of the tube, ovary, or broad ligament the tenderness is most marked low in the side near Poupart's ligament (tuboovarian region). It does not ordinarily extend to the appendix region, though it may, in exceptional cases, involve both regions. A mass may be felt on vaginoabdominal palpation between the uterus and the pelvic wall. There is a history of uterine and pelvic inflammation or other pelvic disturbance.

**Neuralgia** of the superficial nerves of the abdominal wall is evidenced by hypersensitiveness on light pressure or on pinching the skin or scratching the skin surface. If the involvement is one-sided, there is a sharp line of demarcation at the midline and, by testing with a pinprick, the area supplied by the involved nerve can be outlined.

In acute **appendicitis** the pain usually starts in the epigastric area, later shifting to the umbilical area, and finally to the right lower quadrant. There is usually a history of recurring attacks with nausea. Tenderness is most marked about the middle of a line drawn from the right iliac spine to the umbilicus (McBurney's point). By sinking the fingers deeply into the abdomen near the umbilicus and then carrying them outward toward the iliac spine (Fig. 127), the appendix may often be felt to roll under the fingers as a tender cord. The pulse is elevated and the white count is usually over twelve thousand.

With **diseases of the ascending colon** or cecum, the tenderness is not localized but extends over the region of the colon.

With **pyelitis** the point of tenderness is in the costophrenic angle; with ureteritis the point tenderness is between the umbilicus and McBurney's point; and with stone the pain is excruciating, usually accompanied by vomiting. Urinary examination should clinch the diagnosis.

All the possibilities have not been considered, but enough has been included to show the method of differential diagnosis.

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## Chapter 3

# DISEASES OF THE EXTERNAL GENITALS AND VAGINA

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For clinical consideration it is convenient to discuss the diseases of the external genitals and vagina in the following order:

### Classification

Gonorrhoea.

Diseases of the Vulva.

Pruritus Vulvae.

Vulvitis—Intertrigo, Eczema, Herpes, Bacterial Infections, Parasitic Infections, Leukoplakic Vulvitis.

Ulcerative Diseases of the Vulva and Vagina—Simple Ulcers, Chancroid, Syphilis, Tuberculosis, Granuloma Inguinale, Lymphogranuloma Inguinale, Rarer Ulcerations.

Nonmalignant Growths and Swellings—Condylomas, Stasis Hypertrophy, Pudendal Hernia, Pudendal Hydrocele, Varicose Veins, Tumors, Injuries, Hematomas.

Malignant Diseases—Carcinoma, Sarcoma, Metastases.

Vulvovaginal Gland Diseases—Inflammation, Abscess, Sinus, Cyst.

Diseases of the Vagina.

Injuries.

Vaginitis—Simple Vaginitis, Trichomonas Vaginitis, Monilia Vaginitis, Atrophic Vaginitis, Diphtheritic Vaginitis, Emphysematous Vaginitis.

Nonmalignant Growths or Swellings—Endometriosis, Solid Tumors, Cysts.

Malignant Diseases—Carcinoma, Chorionepithelioma, Sarcoma.

Urethral Conditions—Eversion of mucosa, prolapse of mucosa, urethral caruncle, skenitis, suburethral abscess, urethral diverticulum, ureterocele, female prostate, cancer of urethra.

Miscellaneous Disturbances—Skin Diseases, Adhesions of Prepuce or Labia, Hyperesthesia of Vaginal Entrance.

## GONORRHEA

Gonorrhoea is inflammation of the genital organs produced by the gonococcus. The term, when not qualified, is understood to mean gonorrhoeal inflammation of the vulva, vagina, and urethra, i.e., gonorrhoeal vulvitis, vaginitis and urethritis. If the process extends into the uterus or fallopian tubes or bladder, it causes complications known, respectively, as gonorrhoeal endometritis, gonorrhoeal salpingitis, and gonorrhoeal cystitis. Gonorrhoea is sometimes referred to as "specific" vaginitis or vulvitis or urethritis.

### Etiology

Gonorrhoea is caused by contact of the affected organs with a gonorrhoeal discharge, usually in sexual intercourse. The infecting germ (the gonococcus) is a diplococcus, easily stained, and is found in large numbers in the pus cells of all acute gonorrhoeal discharges. In chronic gonorrhoeal discharges it is not