subsided. Sputum negative for tubercle bacilli. Dry cough, and had failure to gain weight between these attacks. *Signs*. Undernourished, and dullness, with weak breath sounds and crepitations at right base, and weak breath sounds and crepitations at left base. *Radiograph*: Tubular bronchiectasis of the right lower bronchi (Fig. 4). *Result*: Bronchitis rapidly subsided. Discharged to convalescent home, with persistent slight dry cough. No change in physical signs.

REFERENCES

- ¹ Sicard, J. A., and Forestier, J.: *Bull. et Mém. Soc. Méd. des Hôp. de Paris*, 1922, xlvii, 463.
- ² Bezançon, F., Weil, M. P., Azoulay, R., and Bernard, E.: *Presse Méd.*, 1924, xxxii, 157.
- ³ Rist, E., Gally, L., and Soulas, A.: *Bull. et Mém. Soc. Méd. des Hôp. de Paris*, 1927, li, 159.
- ⁴ Reinberg, S. A.: *Beitr. z. Klin. d. Tuberk.*, 1927, lxxvii, 507; *Fortschr. a. d. Geb. d. Röntgenstrahl.*, 1927, xxxvi, 116.
- ⁵ Raquez, R.: *Arch. de Méd., Cir. y Esp.*, 1928, xxix, 492.
- ⁶ Ochsner, A., and Nesbit, W.: *Amer. Journ. Med. Sci.*, 1928, clxxv, 175.
- ⁷ Burrell, L. S. T., and Trail, R.: *Lancet*, 1930, i, 182.
- ⁸ Vaccarezza, R. F., and Pollitzer, G.: *Prensa Méd. argent.*, 1931, xvii, 1106.
- ⁹ Ortiz de Landazuri, A., and Minaña, J.: *Arch. Españ. de Pediat.*, 1931, xv, 449.
- ¹⁰ Ihre, Bengt: *Acta Med. Scand.*, 1932, lxxviii, 50.
- ¹¹ Pinchin, A. J. S., and Morlock, H. V.: *British Medical Journal*, 1930, ii, 315.
- ¹² Moll, H. H.: *Quart. Journ. Med.*, 1932, i (new series, xxv cont. series), 457.
- ¹³ Lemon, W. S.: *Med. Clin. North America*, 1926, x, 531.
- ¹⁴ Findlay, L., and Graham, S.: *Arch. Dis. Child.*, 1927, ii, 71.
- ¹⁵ Thorpe, E. S.: *Amer. Journ. Med. Sci.*, 1929, clxxvii, 759.
- ¹⁶ McNeil, C.: Macgregor, A. R., and Alexander, W. A.: *Arch. Dis. Child.*, 1929, iv, 170.
- ¹⁷ Priddle, W. W.: *New York State Journ. Med.*, 1930, xxx, 1077.
- ¹⁸ Moureau, J.: *Thèse de Paris*, 1930, No. 235.
- ¹⁹ Hedblom, C. A.: *Surg., Gynecol. and Obstet.*, 1931, lii, 406.
- ²⁰ McNeil, C.: *British Medical Journal*, 1932, ii, 229.
- ²¹ Möller, Flemming: *Acta Radiologica*, 1928, ix, 460.
- ²² Gibson, D. N.: *Amer. Journ. Roent.*, 1929, xxii, 155.
- ²³ Dethmers, A.: *Acta Radiologica*, 1931, xii, 135.
- ²⁴ Sparks, J. V.: *Brit. Journ. Radiol.*, 1931, iv, 30.

ENDOMETRIOMATA: THE FIVE CLINICAL TYPES*

BY

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(With Special Plate)

I deal here with a condition which is very commonly found in women at or before operation, and one which is very rarely diagnosed or even thought of by practitioners. I refer to endometriomata, tumours which have only come into prominence during the last ten years. I have chosen this subject because my private and hospital records show that a state of endometriosis existed in 8.9 per cent. of my last consecutive 1,000 abdominal operation cases, which proves that this pathological condition is of sufficient frequency to warrant notice. It may be of interest to state that many of these had been treated for months as cases of chronic tubo-ovarian disease, others as slowly growing innocuous tumours of the uterus, others as cases of intractable dysmenorrhoea, and still others as dyspareunia, lumbago, appendicular colic, piles, and *B. coli* infections.

PATHOLOGY

In 1921 Sampson advanced the work of Cullen and Lockyer by demonstrating that tumours frequently found in the ovary, uterus, and broad ligament contained

cells exactly resembling those of the mucous membrane of the uterus. From this finding he evolved the theory that at times menstrual blood regurgitates through the tubes into the pelvic cavity. This retrogressing fluid carries with it particles of endometrium, which implant and graft themselves upon pelvic structures and then tend to invade particular viscera, setting up intense tissue reaction. These aberrant endometrial cells, subject to the influence of hormones from the hypophysis and ovary, retain their physiological capacity of cystic proliferation, secretion, and necrosis, with the result that cysts form, varying in size from a partridge's egg to that of a duck's egg, and surrounded by dense fibrous tissue. The cysts, small or large, contain tarry, chocolate-like material. Such an entertaining theory compels immediate criticism, for there would seem no reason why dying cells of the cast-off endometrium should thrive and multiply, though it must be admitted that such cells falling into the stoma of a recently ruptured Graafian follicle would have an ideal medium for tissue culture. So far, however, experiments along these lines in monkeys have failed to show that desquamating menstrual epithelium can grow upon the peritoneum; nor can such a theory explain how endometriomata can occur at the umbilicus or in the canal of Nuck, or why they are found upon the large intestine and not on the walls of the small gut.

I think I have seen and operated upon endometriomata in every site described above, and it is for that reason—though freely admitting the possibility of Sampson's theory—that I prefer to accept the assumption that these tumours originate from metaplasia of the cells of the peritoneum. The lining mucous membrane of all parts of the Müllerian canal (tubes, uterus, and vagina), as well as the germinal epithelium of the ovary and the pelvic peritoneum, is derived from the same parent tissue—that is, the coelomic epithelium; for it will be recalled that an invagination of this structure gives rise to the Müllerian mucous membrane, which undergoes further differentiation in its various segments from the fimbriae of the Fallopian tubes to the hymen. If such embryonic differentiation is possible, is it not probable that the germinal epithelium of the ovary and the cells of the pelvic peritoneum may come under the influence of certain stimuli (probably endocrinal) in adult life, and undergo or take part in similar changes, resulting in tumours large or small containing coelomic epithelium which has undergone metamorphosis and now has the structure and function of tubal or endometrial mucous membrane?

Whether to believe in the theory of Sampson or that of metaplasia, or, with others, in the assumption of lymphatic or embolic transference, is of little concern here, for this is a matter upon which, in the present state of our knowledge, it is impossible to be dogmatic.

CLASSIFICATION

Clinically my cases of endometriomata indicate that there are five distinct types:

1. That of a uterine tumour.
2. That of obstruction or invasion.
3. That of a tubo-ovarian mass.
4. The symptomatic type, where symptoms only predominate.
5. The post-operative scar type, which is very rare.

Though these variations are often very clearly differentiated, it is not uncommon to find one or more types present in the same individual.

Type 1.—These tumours grow slowly, and are soft and without a capsule. As a rule they are situated near one cornu, and are associated with profuse menorrhagia, but

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dysmenorrhoea is by no means constant. They grow slowly, are not painful, and are rarely seen larger than an orange. There is a tendency to diagnose them as small simple fibroids, to put off surgical treatment, and treat them with radium. I am sure this is a mistake, for personal records show that despite radium treatment elsewhere many of my patients have continued to bleed and have pain. Moreover, in several the tumour has grown larger after radium treatment—which is perhaps not unlikely, seeing that endometriomata are dependent upon sex hormones distilled some distance from the cavity of the uterus. In most countries women with fibroids are on the fat side. My experience of patients suffering from adenomyoma is that they are usually thin. These tumours may originate from the tubal mucosa at the isthmus, or in the interstitial portion of the tube, but most often they commence—as was shown by Cullen—from ingrowths of diverticula of the mucous membrane of the corpus uteri.

Type 2.—This is, I think, the most interesting of all. The tumour formation is most frequently in the recto-vaginal space, and with a forefinger in the vagina and a middle finger in the rectum it can be felt as a wedge with scattered hard nodules projecting into the lumen of the vagina or rectum. The patient may complain of pain during defaecation, and blood-stained mucus with the stool or from the anus, but very rarely indeed is the mucous membrane actually eroded. Until recently many of these women were diagnosed as cases of cancer of the rectum and treated some by mutilative operations, others by deep x rays or radium. As a result of such diagnosis and treatment some have been cured, but it is unfortunate that the reputation of radium and Roentgen rays should be enhanced by virtue of a wrong diagnosis, for the condition was never cancer. In some cases the nodular growth fills and bulges the vault of the vagina, causing dyspareunia. In several such cases sent to me with the diagnosis of cancer, a speculum in the vagina has shown *œil-de-perdrix* purplish nodules projecting through the mucous membrane. These women were all under the age of 40, and in one case only 19 years of age. There is nothing so pathognomonic of an endometrioma as dense nodules at the vault of the vagina in a young woman who is not wasted.

In three of my cases the obstruction was in the large intestine, due to the invasion of the wall of the bowel by an adherent so-called chocolate cyst of the ovary. The cyst had burst, and the endometrial cells had invaded the wall of the sigmoid colon, forming a hard, nodular growth, which partially obstructed the lumen, and might, in pre-war days, have been diagnosed and treated as secondary carcinoma.

In another case, with bilateral chocolate cysts, there was a tumour at the mesenteric border of a prolapsed loop of the large intestine—the size of a golf ball—which had infiltrated almost the complete circumference of the gut. This particular patient had been treated for months as a case of appendicular colic and inflammation of the ovaries.

Very occasionally the endometrial deposits may grow on the anterior surface of the bladder and protrude into the cavity of that organ, giving rise to dysuria and a diagnosis of cystitis or papilloma. I have seen only one such case, and in that the cystoscopic diagnosis was typical. The patient was a young woman. There was no wasting or bleeding, but she gave a history of recent very severe dysuria and dysmenorrhoea. In the anterior wall were nodules under the mucous membrane. The uterus was retroverted and fixed; there was a history of sterility. Both ovaries were prolapsed, fixed, and tender. Following operation, the bladder symptoms entirely disappeared.

Type 3.—In these a mass can almost invariably be found on either side of the uterus, tender and nodular, and in places perhaps cystic and fixed, exactly resembling the inflammatory tubo-ovarian mass which so frequently

follows pelvic gonorrhoea, abortion, or a septic puerperium. A diagnosis of inflammatory origin is the more readily thought of because, as a rule, the uterus is retroverted and fixed, but in cases of endometriomata there is rarely a history of labour or abortion within the last five years, and there may be no reason for suspecting gonorrhoea. This type of case is perhaps the commonest of all, for generally those admitted into hospital have been treated for many months, or it may be years, by diathermy, tamponage, or milk injections, on the incorrect assumption that the tubo-ovarian masses were of inflammatory origin. Frequently they seek hospital on their own account because of continuous pain, menorrhagia, and dyspareunia, or perhaps they have had recurrent attacks of acute pain (not unlike appendicitis) with fever, due to the bursting of one of the chocolate cysts, in which either the tension has become too great or the wall has become perforated by the hyperplasia of the endometrial secreting cells, thereby causing the effusion of grumous fluid, which is intensely irritating and induces dense adhesions to form in surrounding structures. I have operated upon a great number of such cases, and rarely has it been possible to bring the tubo-ovarian mass out of the pelvis without it bursting. The brown fluid extravasated is intensely irritating, and should be carefully mopped up, otherwise it causes fever and pelvic pain for many days. In young people, especially if they are thin, anaemic, or sterile, and have a history of low fever and dysmenorrhoea, this type of case is very often diagnosed as tuberculous. The mistake is most easily made in early cases, where there may be only nodulation or irregularities on the surface of the tubes and ovary, but such error is avoidable if it is remembered that primary tuberculosis of the tubes is rare, that x -ray examination of the lungs will be negative, and no calcareous nodules will be seen in a radiograph of the pelvis. Moreover, a blood count and possibly a von Pirquet test will add confirmation.

If in doubt one can apply a very useful therapeutic test—namely, the injection of 10 c.cm. of skimmed milk or aolan into the gluteal muscle—for in inflammatory disease of the tubes and ovary, and even in long-standing gonococcal cases, there is always a reaction of from 2° to 3° F., but in tuberculous disease of the tubes and in endometriomata of the tubo-ovarian types there is no such reaction. On many occasions I have applied this test when diagnosis was doubtful, or have suggested it in order to convince the doctor of patients I have seen in consultation.

Type 4.—The patients in this group may be spinsters, widows, or married women, long under the care of practitioners without expert knowledge, who have treated symptoms rather than looking for the causes thereof. In some cases, because the symptoms were not outrageous, no pelvic (rectal or vaginal) examination whatever has been made, doctor and patient being diffident about such a proceeding until all treatment has failed. The first and only symptom may be late dysmenorrhoea.

In 1932 a doctor brought his wife from Delhi; her only symptom was recent intense dysmenorrhoea, which he had treated on the usual lines. She was 34 years old, and her last child was born nine years ago. The pain each month was agonizing, accompanied by bearing-down pains in the rectum, which were thought to be due to the congestion of piles. On examination she proved to be a classic case of recto-vaginal endometrioma.

The second symptom, and the only one present, may be *low-grade* fever, which comes on before the period and may last for weeks. Perhaps there may be pelvic heaviness, or there may be tingling pains in the vagina or down the legs. Very often in such cases a vaginal or rectal examination will demonstrate tender, enlarged, fixed ovaries, with nodules on the back of a retroverted uterus or in the line of the broad ligament.

I have a case of this nature in hospital at present. She is a single woman, aged 40. In another institution a few *B. coli* were found in her urine and *B. morgani* in her stools. Because of the fever she was treated with a view to this for months, but rectal examination clearly demonstrated the cause of her symptoms. At operation a typical perforating cyst, the size of a golf ball, was found in the left ovary, and there were at least a dozen *œil-de-perdrix* cysts on the uterus, tubes, and right ovary.

Dyspareunia coming on late in life is always a symptom demanding investigation, and the same observation is necessary for rectal or bearing-down pain in the sacral region, for these may be the only symptoms for months or maybe years before examination proves that a growth of undoubted endometrial origin is invading the rectum or vagina. In another case the only symptom which the patient complains of is a sense of swelling and distension of the structures in the pelvis, which comes on eight or ten days before the period is due and continues during menstruation, gradually getting worse every period. Such a patient may be known to have a retroverted uterus, and her doctor may put such a condition down to congestive dysmenorrhoea, when all the time she is slowly developing endometriosis somewhere in her pelvis. Each month these grafts or heteroplasic coelomic cells swell up, secrete, and necrose, forming cysts containing menstrual-like fluid, for they are directly under the influence of the hormones of the anterior pituitary and ovary, exactly in the same way as is the mucous membrane of the uterus. This being so, any woman suffering from such symptoms should be carefully examined to distinguish pathological from physiological changes in the pelvis. It must not be thought that the first three types are finely demarcated, for it is by no means uncommon to find all three varieties in one patient if diagnosis and treatment have been delayed.

An engineer's wife, 39 years old, was brought to me from Bombay. She had a large adenomyoma at one cornu of the uterus, possibly arising from tubal mucous membrane. At the same time she had double tubo-ovarian chocolate cysts, one of which had perforated and caused partial obstruction of the sigmoid colon by a fresh endometrial growth.

A banker's wife from Allahabad was seen by me in 1925. She had had a Caesarean operation six months previously at Lucknow. There was a beautiful endometrial tumour the size of a pigeon's egg in the scar line, and a typical endometrial deposit in the recto-vaginal space, with *œil-de-perdrix* cysts on both ovaries and at the back of the broad ligament.

DIAGNOSIS

With the knowledge of the different clinical types that may occur I do not think diagnosis is difficult, for, examined with a forefinger in the vagina and the middle finger in the rectum, there are few conditions so typical as nodular endometriomata in the recto-vaginal space. Cancer may be thought of, but the age and health of the patients, the "feel" on examination, and the fact that the mucous membrane is rarely eroded, should help one. A blood count with excess of polymorphonuclear cells would suggest inflammatory tubo-ovarian disease, but in endometriosis there is no such excess, despite the fever and pain, and, possibly, cystic swelling of both ovaries. In tuberculosis there is, as a rule, a high lymphocyte count and anaemia. The therapeutic test—that is, the injection of 10 c.cm. of milk or aolan—is of much assistance in a doubtful case. In endometriosis there will be no reaction, whereas in inflammatory conditions of the tube and ovary the reaction will be high. X rays are useful in difficult cases to exclude tuberculosis, for calcareous nodules may be seen in the pelvis, or possibly arthritic changes between the sacrum and ilium may be demonstrated. Occasionally x rays may show the presence of an unsuspected dermoid

which, being small and subject to inflammatory changes, has simulated and deceived one into making a diagnosis of endometriosis. Finally, a tumour, whether at the umbilicus or in a subnavel scar or in the pelvis, which enlarges at each menstrual period, should always suggest the possibility of endometrial origin.

TREATMENT

To-day expectant treatment is not permissible if the diagnosis and chances of endometriosis exist. The surgical measures should be as conservative as possible, provided the whole area of endometrial cells and their cystic formation are removed. For instance, in an endometrial tumour of the uterus it may be possible to do a myomectomy or an amputation just below the level of the tubes, taking care to remove both Fallopian tubes at the same time. In the same way, on several occasions I have deliberately left a seemingly healthy portion of one or both ovaries when compelled to dissect out tumours of these structures. On the other hand, where there are large cysts, or there is general involvement of the pelvis—particularly if there are recto-vaginal adenomyomata—I have not hesitated to remove tubes, ovary, and uterus. It is never necessary to excise a recto-vaginal growth, nor, in my opinion, is it wise to attempt a total hysterectomy in such a case. In two cases where there was partial obstruction of the bowel due to secondary endometriomata, I did double salpingo-oophorectomy and partial hysterectomy. Both patients have been followed up for the last eighteen months, and have had no recurrence of symptoms.

I have no personal experience of radium in these cases, but I have operated three times for adenomyomata of the uterus which continued to give symptoms despite radium treatment elsewhere. In none of these cases had this element the least effect; indeed, the symptoms of haemorrhage and pain progressively increased, which is perhaps what one would expect when one realizes that the ovaries are probably three or more inches away from the radium, and therefore will not be destroyed. X rays, however, have been used by some with great success, but the danger of using x rays in a case where the diagnosis is doubtful, or in which there is the possibility of inflammation, is great, for an intense inflammatory reaction may result. For this reason I never recommend x rays, although it is possible that many a case of so-called cancer of the rectum, and possibly of the ovary and uterus, has been permanently cured by this means when really all the time it was one of the various types of endometriosis which the patient suffered from, the x rays curing the patient by killing the ovary.

PROGNOSIS

Operative results are as a rule without mortality, provided the patient is seen moderately early. It must, however, be realized that the physiological change we call the menopause will cure, provided the patient is willing to suffer years of invalidism. But to-day such suffering without diagnosis or surgical treatment is surely an anachronism.

During the last twelve months I have done 342 abdominal operations in the Eden Hospital and in private, and of them thirty-eight gave microscopical evidence of endometriosis—that is, 10.1 per cent. In three the tumours were uterine, in twelve they were recto-vaginal, in twenty-three they were tubo-ovarian, and associated with deposits of endometrial structures on bowel, bladder, and broad ligament.

This paper could not have been written had I not the enthusiasm and skill of my pathologist, Dr. S. K. Datta, whose beautiful photomicrographs demonstrate my material.

V. B. GREEN-ARMYTAGE AND S. K. DATTA: ENDOMETRIOMATA

FIG. 1.—*Endometriosis of the ovary.* Section shows, on the left, a portion of cyst-wall formed by thinned-out and compressed ovarian stroma. Just beyond this wall is a mass of typical endometrial tissue embedded in ovarian stroma. Above this highly congested endometrial tissue is a small cystic space; below, two other smaller cysts are also seen, of which the one to the right shows a glandular acinus near its wall.

FIG. 2.—*Endometriosis of the ovary.* Higher magnification of a portion of the endometrial tissue.

FIG. 3.—*Endometriosis of tubo-ovarian mass.* Section showing a mass of tissue consisting of endometrial glands and a highly congested stroma, situated below and to the left of the centrally placed lumen of the tube. Also, surrounding the lumen, above and to the right, is a band of endometrial tissue in the musculature of the tube.

FIG. 4.—*Endometriosis of tubo-ovarian mass.* Higher magnification of a portion of the invading band of endometrial tissue in the muscular coat.

V. B. GREEN-ARMYTAGE AND S. K. DATTA: ENDOMETRIOMATA

FIG. 5.—*Endometriosis of the uterus.* Section shows scattered areas of cellular connective tissue with tubular glands embedded in them (resembling endometrial tissue), surrounded by muscle bundles.

FIG. 6.—*Endometriosis of transverse colon.* Section shows a cystic space at top of figure, lined by low columnar epithelium. In the fibrous wall of the cyst are seen islets of endometrial glands with typical stroma cells.

A. L. D'ABREU: CLOSED RENAL TUBERCULOSIS

FIG. 1.—External appearance of the removed kidney.

FIG. 2.—Cut surface of the removed kidney.