A British Medical Association Lecture ON PRACTICAL APPLICATIONS OF RECENT VIEWS ON THE MENSTRUAL FUNCTION.

GIVEN TO THE SHEFFIELD DIVISION, DECEMBER 9TH, 1927,

BY

BECKWITH WHITEHOUSE, M.S., F.R.C.S.,
PROFESSOR OF GYNAECOLOGY AND OBSTETRICS, UNIVERSITY OF
BIRMINGHAM; GYNAECOLOGICAL SURGEON, GENERAL HOSPITAL,
BIRMINGHAM; SURGEON, BIRMINGHAM MATERNITY HOSPITAL.

STRANGE beliefs about menstruation are very widespread, and this element of mystery seems, as Novak says, "to have inhibited intelligent efforts to study." It was taken for granted that the function was essentially a cleansing process, its purpose being to cleanse the blood of various impurities, a view still held to-day by not a few lay members of the community. One of the important practical applications of recent views on the menstrual function is the sweeping away of this atmosphere of superstition and speculation. During the last few years what may be described as a new "sexual physiology" has been written, and facts have come to light which prove that the human species in essential details shows but a variation of sex phenomena common to other members of the mammalian family—a variation designed to secure the maximum reproductive activity. This knowledge in due course must produce in the lay mind a more natural atmosphere with regard to everyday ideas about the menstrual function. When menstruation ceases during the years of active sexual life a woman, if not pregnant, still commonly believes herself to be retaining some noxious principle to the detriment of her health. Also many members of our own profession still regard the menstrual function as being nothing more than a preparation for pregnancy.

I need not describe at length the observations and experiments which have led to the modern conclusion that, in the human species, menstruation is a composite function involving two distinct factors. It is necessary, however, to state briefly the nature of the essential factors, as otherwise much of what follows may be difficult to comprehend.

The Oestrous Cycle.

The time when physiological activity of the reproductive system occurs in mammals is called the sexual season, and during this period a series of cyclical phenomena take place known as "oestrous cycles." Each cycle is physiologically divided into four separate phases:

1. A period of sexual rest (amenorrhoea).
2. A period of growth and functional activity of the sexual organs (pro-oestrus).
3. A period of "heat," when fertilization is effected (oestrus).
4. A period of pregnancy or "pseudo-pregnancy" (met-oestrus).

Considerable variation occurs in different species with regard to the presence, absence, and duration of each of these various subsections of the oestrous cycle, and also with regard to the number of complete oestrous cycles in each sexual season. Breeding, artificial selection, and luxurious conditions can and do introduce great variation into the sexual cycles of most animals—a fact commonly utilized in certain breeds of domestic animals.

Haemorrhage from the genital tract in the case of different species occurs at two points of the oestrous cycle. In some, as the bitch, slight bleeding from the uterus is seen at the end of pro-oestrus due to extreme local hyperaemia of the sexual organs. In other types, as the cow, haemorrhage only occurs at the end of the pseudo-pregnancy, from necrosis and expulsion of a false decidua. In yet other animals—for example, sheep, mare, sow, and various rodents—no haemorrhage into the uterine cavity occurs at all, either during the stage of pro-oestral congestion or during involution at the end of pseudo-pregnancy.

Menstruation in the Human Female.

In the human female ovulation occurs from the thirteenth to the seventeenth days of the menstrual cycle, and from this point a state of pseudo-pregnancy exists until its

termination about the twenty-eighth day. Necrosis of the menstrual endometrium, or "decidua," as it should be called, then takes place and external haemorrhage begins. *Pari passu* with the completion of the pseudo-pregnancy a state of pro-oestrus develops, which also reaches its acme about the twenty-eighth day of the cycle, and persists during the expulsion or abortion of the pseudo-pregnancy. This is followed at the conclusion of the menstrual haemorrhage by a short oestral period—Nature's provision to promote fertilization of the next ovum to be liberated from a maturing Graafian follicle.

The menstrual discharge in the human species, therefore, normally contains blood as a result of two distinct factors—namely, that resulting from necrosis and abortion of the pseudo-pregnant decidua, and that due to pro-oestral hyperaemia. The blood is mixed with the secretion of the uterine glands liberated as the result of necrosis of the superficial or compact layer of the menstrual decidua. In all mammals activity of the uterine glands is a prominent feature of pro-oestrus, and the human species is no exception to the rule. The glands of the body and the cervix probably have, however, a very different function. The secretion of the corporeal glands is poured out only after necrosis of the endometrium has occurred. It contains excess of calcium, a ferment or "thrombolysin" which dissolves blood-clot, and apparently also a hormone which stimulates oestrus. The cervical glands, on the other hand, only produce mucus, and probably their function is to facilitate the passage of products from the corpus uteri to the vagina.

The glandular activity of the endometrium during the pro-oestral state is a very interesting phenomenon. It is more than possible that the high calcium content of the secretion is a provision of Nature for the needs of the developing ovum should fertilization occur, as is the case with the so-called "mare's milk" of ungulates. The other great function of the secretion is to dissolve and clear away the products of the unfertilized abortion or unwanted decidua if fertilization is not effected. This fact has a practical application to which I shall refer presently in connexion with the cause of menstrual pain. In the light of recent work upon ovulation and the corpus luteum, menstruation must be regarded as representing primarily the end of a pseudo-pregnant state resulting from the preceding ovulation. The unfertile abortion is in addition complicated, and in a sense masked, by the very evident glandular activity, oedema, and hyperaemia of pro-oestrus, superimposed upon the primary phenomena in readiness for the next ovulation.

It is a provision of Nature to waste no time. Not only is anoestrus or the "rest" period in the human species completely abolished, but while the remains of the previous debacle are being cleared away the stage is being set for the next scene, which Nature trusts may be more successful. Appreciation of the fact that menstruation involves two functions in the sexual cycle, each serving a definite physiological process, but overlapping the other, throws light upon what otherwise is a difficult problem.

"Oestrin" and "Ovarin."

The menstrual function has been studied during recent years from both these points of view. During the last twelve months references to the ovarian hormones, particularly the so-called "oestrin," have frequently appeared in the medical press. Now the recognition, isolation, and investigation of the physiological properties of oestrin is research associated with the pro-oestral and oestral factors of the sexual cycle. On the other hand, the clinical and experimental observations resulting from destruction or removal of the Graafian follicle or corpus luteum are concerned with the pseudo-pregnant aspect of menstruation.

The cause of pro-oestrus and oestrus is undoubtedly an accumulation in the tissues of the hormone oestrin demonstrated by Allen and Doisy in America and by Dickens, Dodds, and Wright in this country. This oestrus-producing hormone, although present in the liquor folliculi, is not confined to the follicle. It has also been demonstrated in ovarian tissue without follicles, in the human placenta, and in the secretion and tissues of the uterus. It has not, however, been found in the corpus luteum, and,

according to the recent experiments of A. S. Parkes, its production is also independent of ovarian follicular activity.

At the present time there appears to be rather a widespread opinion that the oestrus-producing hormone is all-important in the production of menstruation in the human species. Personally I am not prepared to admit that it is more than one factor. Oestrin will cause hyperaemia, development, and glandular activity of the uterus, but there is no evidence to show that it produces growth of the endometrial stroma which, when completed, constitutes the decidua. Decidual development requires the constant stimulus of another hormone of the ovary—"ovarin," present in both Graafian follicle and corpus luteum. Oestrin cannot be demonstrated in the corpus luteum, and yet, when this body is excised, necrosis of the endometrium with haemorrhage always occurs. It terminates the pseudo-pregnant state.

An interesting series of observations carried out in my department showed not only that destruction of the corpus luteum results in necrosis of the endometrium in from forty-eight to seventy-two hours, but that similar trauma to ripening Graafian follicles also produces a like effect. In other words, the integrity and development of the endometrium require the constant supply in the circulating blood of a hormone other than oestrin, and elaborated in both follicles and corpus luteum. If this supply is cut off for any reason, then the endometrium necroses at whatever stage of development it may be. The fact that menstruation occurs with necrosis of the endometrium within a few hours of excision of the corpus luteum appears to provide indisputable evidence of the independence of ovarin and oestrin. Both hormones are important for the economy of the individual and the maintenance of the species, but each serves a separate function.

The essential points, therefore, in the theory of menstruation which I am setting out are these: The menstrual function in the human female represents two things—

- (1) The abortion of a useless decidua of the pseudo-pregnancy corresponding to the preceding ovulation.
- (2) The acme of pro-oestrus to promote fertilization at the succeeding ovulation.

The abortion is the result of cutting off the supply of ovarin through death of the ovum and its corpus luteum. Pro-oestrus is caused by accumulation in the tissues and uterine glands of oestrin.

These views receive a practical application when the various pathological conditions associated with the menstrual function are considered. In view of the complexity of the function it is not surprising that anomalies of it are common; indeed, it would be strange were it not so. The establishment and regularity of the normal menstrual rhythm in health from puberty to the menopause is a very remarkable phenomenon, and when we take into consideration the changes in the sexual cycle which can artificially be produced in other members of the mammalian family by such factors as changed environment and feeding, it is only to be expected that the complications and complexities introduced by evolution and civilization will be reflected in variation from type.

"White Menstruation."

Such variation usually proceeds along progressive lines, but occasionally phenomena that are atavistic or reactionary are seen in the human species. It is important to remember that atavism can occur with regard to physiological function just as it does with anatomical structure. Two or three examples will make the point clear. The first is the phenomenon known as "white menstruation." Individuals are occasionally seen in whom the menstrual function is never exhibited on normal lines, in that no haemorrhage occurs, although the conformation and structure of the sexual organs present no abnormality. Such women experience the usual menstrual moulting attributable to the onset of the "negative phase" and the development of pro-oestrus; but the subsequent discharge consists of the secretion of the uterine glands only. There is no endometrial necrosis and no external haemorrhage. For a parallel we must study the sex cycle of a polyoestrous mammal such as the merino sheep, where the end of pseudo-pregnancy is not accompanied by tissue necrosis.

Minor degrees of the same atavistic type are not so uncommon. In these subjects the menstrual haemorrhage is very slight and may only be present for a few hours. On the other hand, the periods may be separated by what are apparently long intervals of amenorrhoea. Patients of this type commonly also suffer from severe menstrual pain caused by defective physiological function of the uterine secretion.

The important practical point is that ovulation is normal and therefore fertility is not impaired. Hence it is unwise ever to express an opinion upon the possibility of pregnancy in cases of apparent amenorrhoea without first making a very careful physical examination.

"Vicarious Menstruation."

Another interesting anomaly of somewhat similar type is the so-called "vicarious menstruation." The explanation of these interesting cases probably lies in an abnormal and excessive pro-oestral hyperaemia, associated with atavistic absence of endometrial necrosis. A parallel can be found in the corneal haemorrhage which occurs during the pro-oestrus of some rodents. On two occasions I have known haematemesis occur during the pro-oestral state of the domestic cat.

Another explanation of vicarious menstruation is unbalanced action between the pseudo-pregnant abortion and the pro-oestral state. The local congestion and general vaso-dilatation produced by the activities of oestrin are normally relieved by the haemorrhage which ensues when the pseudo-pregnancy ends. If for various reasons, atavistic or otherwise, this physiological necrosis does not take place, the congestion is likely to be relieved by haemorrhage from other mucous surfaces. There is, I think, very little doubt that although both factors of the menstrual phenomenon usually coincide, either may be suppressed independently of the other. If, for example, ovulation is defective, pseudo-pregnancy does not occur and the individual, incidentally, is sterile. On the other hand, oestrin may be produced in normal or even excessive amount, giving rise to an exaggerated pro-oestral state. In some cases of hyperthyroidism there is evidence of excessive oestral activity, but this by no means always coincides with increased fertility or even increased menstrual loss. In exophthalmic goitre, during the early stages, we know that menorrhagia is the rule, and can be explained by excessive pro-oestral congestion superimposed upon the menstrual abortion. In the later stages ovulation is suppressed, and although pro-oestrus and oestrus are often marked, amenorrhoea is commonly present.

When ovulation occurs without the development of oestrus, menstruation is rather scanty, but fertility is unimpaired. Such individuals are the subjects of sexual frigidity, and commonly dysmenorrhoea also.

The third and last example of atavism to which I shall call attention is the occasional passage of a large solid menstrual "clot" as the sole manifestation of the menstrual function. This phenomenon, which is normal in the case of some monkeys, is sometimes seen in the human species. I met with an example some years ago in the case of a girl of 19 who, from the age of 16, regularly at each period voided a solid rounded clot, which superficially resembled an early abortion. It was passed apparently without pain and was unaccompanied by any other discharge. I recently heard that this patient is now married and has been pregnant. It was interesting to note that after marriage the menstrual discharge assumed the normal character and no more clots were noticed.

Abnormal Uterine Haemorrhage.

The variations of the menstrual function which come most frequently under our notice are those concerned either with excessive or irregular haemorrhage, or with intense pain.

For many years we have been accustomed to group our cases of pathological uterine haemorrhage under one or two headings—namely, "menorrhagia" and "metrorrhagia." In the early days of gynaecological physiology and pathology this simple classification served a useful clinical purpose. It was undoubtedly crude and based upon clinical phenomena only, but it sufficed for the time. As knowledge

increased a revised nomenclature has gradually been evolved, and new terms have been introduced to denote the various clinical types of pathological haemorrhage.

Critically speaking, abnormal bleeding falls naturally into one of four groups: the menstrual "periods" are too frequent (epimenorrhoea), or they are too severe as measured by the blood lost (menorrhagia), or they are too prolonged (menostaxis), or the haemorrhage is quite irregular (metrostaxis).

Too frequent menstruation, or "epimenorrhoea," is the clinical manifestation of abnormal ovulation. The normal rhythm is, of course, an index of ovarian function in terms of follicular activity. Epimenorrhoea is commonly associated with ova of low vitality, and therefore is frequently combined with sterility. Not infrequently it is also a clinical symptom of abnormal bodily metabolism. Sterility without physical signs is often associated with a low basal metabolic ratio, and, if combined with epimenorrhoea, the basal metabolic ratio should be estimated. If reduced, improvement in the general bodily health and the administration of thyroid extract may remedy both conditions.

Care must be taken not to confuse epimenorrhoea with irregular uterine haemorrhage or metrorrhagia. Any haemorrhage from the genital tract is commonly regarded by a woman as being a menstrual "period," normal or otherwise. When there is an apparent rhythm established, even with abnormal bleeding, a patient naturally comes to the conclusion that her "periods" are too frequent, and she expresses herself in these terms.

Now there are two periods of life when epimenorrhoea is common—so common, in fact, as almost to be physiological. One is at puberty and the other is at the menopause. At both these epochs a state of ovarian instability exists. At puberty the sexual organs have reached functional activity, due most probably to the development and repeated stimulation of oestrin. At the menopause a state of sexual instability exists owing to exhaustion of the supply of one or both of the ovarian hormones. It is interesting to observe, however, that the sexual instinct is often developed before puberty and, of course, commonly persists for many years after the menopause, pointing to the independence of the oestral phenomena in the menstrual function. At both puberty and the menopause, however, there is one factor in common—namely, the presence in the ovaries of ova of low vitality. In the one case it is due to immaturity, in the other to sexual old age. The occurrence of these ova of low vitality, observed in many animals, is, I believe, intimately associated with, and probably the cause of, the epimenorrhoea and metrorrhagia of puberty and the menopause.

Relation of Follicular and Lutein Cysts and Haematomata to Uterine Haemorrhage.

I have already said that experimental destruction of maturing Graafian follicles produces necrosis of the developing endometrium. Now if such necrosis and haemorrhage can be produced by trauma it is reasonable to suppose that a similar condition of the endometrium will result from death of the Graafian follicle and cessation of its physiological activity. In ovaries that are examined both at puberty and the menopause, from patients in whom epimenorrhoea is a prominent symptom requiring treatment, evidence of abnormal ovulation is frequent. Such ovaries as I have examined contain many cystic follicles in which the epithelium is wanting; or haemorrhage has occurred leading to the production of follicular haematomata. Certain gross pathological conditions in which irregular menstruation is a common symptom—for example, uterine fibromyomata, backward displacements of the uterus, and pelvic inflammation of a chronic nature—commonly exhibit similar lesions in the ovaries. The abnormal haemorrhage and the sterility, which are often combined in these cases and which have previously been attributed to some hypothetical lesion, such as a coexisting "endometritis," owe their common origin to the presence of these dead follicles. The defective ovulation which initiates the train of events is not unlikely the result of circulatory changes in the ovaries produced by the pathological lesion present.

If this conception is correct—and there is certainly a considerable weight of clinical and pathological evidence to support it—the uterus is to be regarded only as the mirror of abnormal ovarian activity. In the past, I am afraid, it has suffered many assaults from being in bad company!

An important practical application based upon the connexion between abnormal ovulation and uterine haemorrhage is the position which ovarian surgery will occupy in the future in the therapy of uterine bleeding. The cystic ovary, or the ovary which contains haematomata, assumes a new importance in the light of these facts. Double oöphorectomy has, of course, long been condemned, but partial oöphorectomy, by removing diseased follicles or pathological corpora lutea, may well prove to be a useful application. Cystic follicles increase intraovarian tension and so interfere with subsequent ovulation. A vicious circle is indeed set up which tends to perpetuate irregular uterine bleeding and sterility. Follicular haematomata can be artificially produced in certain animals—for example, the cat—by the prevention of pregnancy through coitus with a vasectomized male. It seems possible, therefore, that anticonceptual measures in the human species may be followed by a like occurrence, and that the irregular menstruation which sometimes accompanies the practice has its explanation in this manner.

The circulation in the ovary is without doubt a very important factor in normal ovulation. When it is altered as the result of surgical trauma, prolapse of the ovary, the development of uterine or ovarian neoplasms, or pressure from inflammatory adhesions, ovulation is defective, and this is reflected clinically in the occurrence of irregular and protracted uterine bleeding. During operations upon the Fallopian tubes the greatest care should therefore be exercised not to interfere with the ovarian circulation. Furthermore, in the course of myomectomy for uterine fibromyomata, the ovaries should always be inspected and diseased follicles or corpora lutea excised.

A backward displacement of the uterus is always more serious if the ovaries are also prolapsed and their circulation affected. In fact, the existence of irregular uterine bleeding in association with a retroverted uterus may almost certainly be considered to be due to defective ovulation and the presence in the ovaries of pathological follicles. If this symptom is present there is a clear indication for surgical intervention—for example, ovarian suspension.

Ovarian Grafting.

Another practical application of somewhat similar nature is concerned with the value of ovarian grafts. Ovarian grafting is advocated in certain conditions, such as pelvic inflammatory disease, which involve the separation of both ovaries from their normal attachments, upon the assumption that the maintenance of the menstrual function is essential to the well-being of the individual.

Now if such a graft produces only follicles which reach a certain stage of maturity and then die, the resulting endometrial necrosis and accompanying uterine haemorrhage which represent the "menstrual period" are clearly only phenomena of doubtful value, beyond conferring a possible psychological benefit. Menstrual haemorrhage as such is not an essential to the body economy and well-being, beyond the fact that it may relieve the local and general congestion produced by the action of oestrin. The vasomotor "flushes" of the menopause appear to be caused by the unbalanced action of oestrin without local depletion. Sexual life is not commonly affected by total ablation of the ovaries, and there is therefore no necessity to graft ovarian tissue with the idea of conserving oestrus. There thus remains only the metabolic factor upon which to base the *raison d'être* of ovarian grafting. Since evidence is available which tends to prove that the cells of the ovarian stroma are responsible for the hormone which is an integral part of the "sex complex," it appears reasonable to suggest that only this tissue should be employed for the purpose of grafting. To insert deliberately into the tissues Graafian follicles, which in all probability will necrose before maturation owing to circulatory deficiencies, is to confer upon the patient a

very doubtful benefit. It is infinitely better, in my opinion, for a follicle never to develop at all than for it to reach a partial state of maturity and then die. This state of affairs is only too common a feature at the beginning and end of active sexual life.

Menorrhagia and Menostaxis.

Uterine haemorrhage of the menorrhagic and menostatic type is more commonly associated with local uterine lesions. True menorrhagia is a symptom of uterine insufficiency which may affect either the endometrium or the metrium. In the former a diagnostic curettage will give very useful information, especially if considered in relation with the character of the menstrual discharge. A large amount of lochia containing few or no thrombi implies oversecretion of the corporeal glands, and is commonly associated with hypertrophy of the endometrium. On the other hand, if large clots are present in the menstrual discharge the probability is that the endometrium is atrophic, or deficient in thrombokinetic power. The former type is very suitable for radium or x-ray therapy; the latter is very likely the result of chronic uterine infection, and hysterectomy or other surgical procedure may be required.

Excess of the oestrin hormone is dangerous, because it produces extreme hyperaemia and oversecretion of the endometrial glands. This superabundant secretion produces excessive thrombolysis in the endometrial tissues and leads to the production of a local state of haemophilia. Here the indication is to remove the redundant endometrium by curettage and endeavour to control the overproduction of oestrin by the application of x rays to the ovaries, and by thyroid extract in moderate doses.

In some pathological states, as in chronic subinvolution and in uteri containing multiple fibroids, the uterine cavity remains permanently enlarged. This favours endometrial overgrowth, either diffuse or local, and is a fertile cause of serious menstrual bleeding. Under normal conditions the uterine cavity is, of course, practically non-existent, owing to approximation of the anterior and posterior walls. Whenever a cavity is produced the endometrium, under stimulus of ovarin, either undergoes diffuse growth or develops a polypus in an attempt to obliterate the same. It seems as though the uterus abhors a vacuum, and therefore intrauterine tension exerts a not unimportant influence upon the degree of regeneration of the endometrium which normally follows the termination of the pseudo-pregnant state. This tension is normally maintained by the tone and state of development of the uterine muscle. Diminished tone will favour endometrial overgrowth. This is why a simple curettage only produces a temporary cessation of menorrhagia in the case of the subinvolved uterus commonly called "chronic metritis." Patients should therefore always be warned that the operation must be repeated when the periods again become excessive. The only permanent cure is to produce necrosis and cicatricial fibrosis of the endometrium by means of radium, and since many of these cases occur in comparatively young women, repeated curettage is probably preferable. Uterine insufficiency at the menopause is, however, always best treated by the intrauterine application of radium, when such remedies as ovarian hormone or cotarnine salts have failed to produce any effect upon abnormal haemorrhage.

Menstrual Pain (Menorrhagia).

I now refer briefly to the symptom of pain in relation to the menstrual function. The rhythmic variations in the metabolic cycle which accompany the development of oestrus, and are associated with the termination of the constantly repeated pseudo-pregnant state, undoubtedly produce in women a condition of unstable nervous equilibrium which may easily be translated by adverse conditions into painful stimuli.

In animals generally the advent of puberty is commonly followed at no distant date by the exercise of the reproductive functions and the occurrence of pregnancy. In the human species, owing to early puberty, social exigencies, and the dictates of custom, it is inevitable in civilized countries that many sexual cycles must be completed before gestation occurs, if at all. "Homo" is a

polyoestrous mammal in whom occurs a consecutive series of short sexual cycles from puberty to the menopause. There is no rest period, and it is only when pregnancy occurs that there is any variation from the normal metabolic cycles, or the periods which Head has referred to as "epochs of diminished automatic control."

Apart altogether, however, from this aspect, there is another factor of considerable importance which moulds our conception of pain in relation to the menstrual function. This is what may be called the education of the pain sense. Women have been led by tradition and superstition to expect a certain amount of pain at the menstrual epoch, and we see an expression of this mental attitude in the term "poorly times." There is little doubt that the psychological factor, and especially mental suggestion, has a considerable influence upon the development of menstrual pain. If pain is expected its incidence is favoured, and by repeated assaults the brain may be educated to an abnormal appreciation of subacute stimuli. This was illustrated during the late war, when men under extreme nervous stress sometimes appeared to suffer acute pain from comparatively trifling lesions. In the same way, once a profound impression has been received by the cerebral cortex it tends to persist even when the cause is removed.

With the normal hyperaesthetic state that pertains to the oestral epoch it is easy for subjective sensations to become pathological, and for such sensory impressions to be interpreted in terms of pain. For a patient, however, to assert, when asked whether her menstrual periods are painful, that she experiences "no more pain than the ordinary," implies a pathological attitude of mind with regard to the function which, in altered circumstances, may easily gravitate into a state of incapacity.

That a healthy state of mind will go far towards removing the painful disability of menstruation is well exemplified by the incidence of severe incapacitating pain among the nursing staffs of hospitals. Although nurses, like other people, suffer discomfort from the menstrual function, they commonly learn to carry on in spite of it. During the twenty years that I have been associated with my hospital I can only recall three instances of a nurse being "warded" for dysmenorrhoea.

To arrive at any true estimate of the frequency of menstrual pain in the community is thus a matter of considerable difficulty. During the last few years in my clinic I have adopted a very rigid classification of cases in relation to pain associated with the menstrual cycle, restricting the word "dysmenorrhoea" to the severe incapacitating type only, for many years included under the heading "spasmodic," and more recently termed "intrinsic" by Blair Bell. According to this conception, true or essential dysmenorrhoea takes no account of the backache, pains in the limbs, headache, and general discomfort commonly associated with the onset of the menstrual function. These symptoms, in a sense characteristic of the "negative phase," vary with the hyperaesthetic index of the individual. Neither do I allow the label "dysmenorrhoea" to include those cases of menstrual pain associated with gross disease of the pelvic organs—for example, pelvic inflammation, fibroids, etc. When used in this connexion it is a misnomer, and the term "menorrhagia," introduced by Massey, is preferable to express painful menstruation which is a mere incidental clinical concomitant of a variety of lesions.

Essential dysmenorrhoea, meaning "difficult menstruation," is a very definite condition, with a special pathology and accompanied by definite clinical symptoms. Much confusion has existed in the past owing to attempts having been made to describe both a symptom and a disease by the same name. To clear the air we must recognize that, although both are comparatively common, dysmenorrhoea is one thing and menorrhagia another.

Dysmenorrhoea.

True dysmenorrhoea is uterine colic. The normal contractions of the uterine body which occur at the commencement of each menstrual abortion are irregular, severe, and painful, instead of being regular, slight, and painless. The pain usually begins within an hour or two of the first

appearance of the menstrual lochia. Occasionally it precedes the onset. It is distributed over the whole of the hypogastrium and, although the actual "pain" generally lasts for two or three minutes only, the period of remission may be so slight that the pain appears to be almost continuous. At a varying interval up to twenty-four hours, and occasionally longer, the acute symptoms subside and a local aching only remains. There is, however, no sudden cessation of the symptoms, but in other respects the clinical picture has much in common with an early abortion. The severity of the pain often causes vomiting at the acme of the attack, and sometimes signs of mild shock are present, as indicated by a thin, rapid pulse, pallor, or even temporary loss of consciousness. If the function commences during the night the pain usually rouses the patient.

During the acute stage the amount of menstrual discharge is small. It increases as the symptoms abate, and if the pain has been very severe the lochia are usually profuse. The characteristic clinical feature about this discharge is that it often contains definite naked-eye fragments of tissue in addition to the usual small clots. This tissue, in the form of flakes, plaques, or "moles," is usually present in the vagina on the second or third day of the function after the pain has disappeared. Occasionally it remains in the uterine cavity and does not reach the vagina. This is proved by curettage, performed when the menstrual pain is at its height, in patients who do not pass solid tissue.

The severity of the pain appears to vary directly with the size and amount of solid tissue expelled from the uterus. An interesting point is that patients do not pass this tissue at every period. Not infrequently it happens that after a considerable amount of material has been voided with much pain at one period, the succeeding function or functions are relatively painless, and no tissue can be found in the lochia. This true type of dysmenorrhoea appears to have no definite relationship either to the nervous system of the individual or to the anatomical conformation of her uterus. Genuine dysmenorrhoea such as I have described occurs in the stolid, apathetic patient just as it does in the highly strung nervous type. In both types, as in the normal individual, every period is not painful.

With regard to the relation of various uterine anomalies, the older standard textbooks on gynaecology are full of references to the "conical cervix" and the "pinhole os" as being potent factors in the causation of dysmenorrhoea. Herman was the first to call attention to the fallacy of these statements by pointing out that many cervical abnormalities occur without any menstrual discomfort. Recently the anatomical point of interest has moved from the cervix to the corpus uteri, and it is fashionable now to talk about the "hypoplastic uterus," and particularly of the so-called "cochleate uterus."

Now my experience is that the very same arguments may be advanced with regard to these developmental defects as those put forward by Herman when considering the "conical cervix." It is that these anomalies occur not infrequently without the association of any menstrual pain at all. Also every period is not painful, even when a considerable degree of anatomical deformity exists. The most that we can concede is that if a hypoplastic uterus is superimposed upon the other factors concerned in the production of dysmenorrhoea it will tend to make the pain more severe. It is therefore not justifiable to promise a patient with genuine dysmenorrhoea complete and permanent relief from her pain after dilatation or even division of her cervix. The cause of the pain lies in the uterine body, and is related to the separation and expulsion of the compact layer of the menstrual decidua.

Microscopical investigation of the tissue expelled from the uterus in cases of dysmenorrhoea has brought to light some interesting facts. The outstanding feature is the marked degree of decidual development in the connective tissue cells of the endometrial stroma. This decidual appearance is, of course, well known in the case of large menstrual casts—the so-called membranous dysmenorrhoea; but it is important to recognize that the same change is present in the small fragments of tissue recovered from the lochia or "curettings" of patients with dysmenorrhoea who do not pass large "membranes."

Abnormal and excessive production of decidual cells in the endometrium prevents the normal molecular disintegration at the end of pseudo-pregnancy, and the separation and presence of this tissue in the uterine cavity excite those irregular and painful uterine contractions which we recognize clinically as dysmenorrhoea.

Deciduomatosis.

The cause of dysmenorrhoea appears, therefore, to be intimately associated with the physiology of decidual production.

Decidual reaction in connective tissue cells has recently been shown by various observers to occur in tissues outside the uterus—for example, the appendix, omentum, peritoneum, and pelvic lymphatic glands. It is dependent entirely upon the presence of a functioning corpus luteum. The patchy distribution of these ectopic decidual cells shows, however, that although a circulating lutein hormone is essential, only certain cells are capable of reacting to the stimulus. In other words, a local factor also is involved. What is this local factor?

Experiment has proved that it is possible in certain animals to stimulate directly the production of decidual cells in the endometrium by introducing foreign bodies into the uterus or by incising the mucosa, when a corpus luteum is present in the ovaries. These artificial deciduomata can be produced in guinea-pigs after ligation of the Fallopian tubes or in rabbits after coitus with a vasectomized male, showing that the decidual stimulus is not provided by the ovum. In rats decidual formation can be stimulated by mechanical irritation of the cervix uteri by a glass rod, or by introducing pollen grains or fine threads into the uterine cavity.

Now it is evident that a very close analogy exists between these experiments and the pathological problem presented by dysmenorrhoea; for in both there is excessive and irregular formation of decidual tissue in the non-pregnant state. It is possible, therefore, that this abnormal decidual production may be caused by defective autolysis of the menstrual clot at the previous period. Complete autolysis depends upon the adequate supply and physiological action of the corporeal uterine glands, and this in turn is a manifestation of normal oestrus. If the autolysis is incomplete, and the products of the previous menstrual abortion are not completely removed, the small thrombi and microscopical fragments resulting from tissue necrosis, and remaining *in utero*, act in the same way as the pollen grains experimentally introduced into the uteri of animals.

Dysmenorrhoea may, therefore, be the result of a defective oestrus at the preceding menstruation, possibly inhibited by lutein excess. Certainly the glands present in the endometrium obtained immediately before a "period" in these patients are comparatively small, compressed, and inactive, and the local hyperaemia is slight. This all points to deficient oestrin, and therefore, in the recently isolated oestrus-producing hormone of the ovary, a useful therapeutic agent may be available to control excessive decidual function and so prevent dysmenorrhoea. Incidentally, it should be noted that many of these patients are also sterile, again pointing to a possible deficiency of the oestrous hormone. Whether abnormal anatomical conditions of the cervix uteri, by causing irritation, have any influence in the production of excessive decidual reaction is entirely problematical. The experimental investigations on the cervix of rats should, however, be remembered in this connexion.

Medico-legal Value of "Decidual Cells."

In conclusion, there is one other point to which I may call attention—namely, the presence of well-marked decidual cells in the uterus cannot be regarded from a medico-legal standpoint as evidence of a recent pregnancy. I have already expressed the opinion that there is also no essential difference, but only one of degree, between the corpus luteum during menstruation and during pregnancy. The only indisputable evidence of a recent pregnancy, therefore, upon which I personally would care to rely is the existence of purely embryonic tissue—for example, syncytium or chorionic villi.