MENSTRUATION AND DYSMENORRHŒA.

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THE period of puberty, commencing at ages varying with the mode of life and climate, is characterised by the appearance of a regular sanguineous discharge from the sexual organs, which, occurring at intervals of from three to four weeks, is called menstruation.

This phenomenon, which is almost exclusively confined to the human species, has, since very ancient times, attracted the attention of physicians and the laity. It is not my intention in this brief description to recapitulate all the views and hypotheses which have gained acceptance with regard to this subject, neither do I intend to enter upon the field of statistical investigation, towards which, down to very recent times, a predilection not altogether intelligible has been manifested. We are in the possession of voluminous, by no means uninteresting works, containing most laboriously compiled statistics and averages with regard to the time of the commencement and cessation of menstruation, and its peculiarities in small and large women, in the weakly and robust, and in blondes and brunettes. These are certainly not unworthy objects for scientific investigation, but they are only of subordinate importance as far as regards the comprehension of the whole subject, the more so because the result pretty nearly coincides with what has been known for a very long time: this being, that in the majority of cases menstruation commences in temperate climates between the twelfth and eighteenth year, and continues for a period varying from thirty to thirty-five years. More important,

however, than such calculations as these is the question with reference to the nature and physiological amount of the menstrual discharge. With regard to the last mentioned point, nothing can be asserted positively, for notwithstanding definite statements to the contrary (*conf.* Krieger on "Menstruation"), the determination of the quantity is too uncertain and the individual differences in this respect appear to be too great. On the other hand, certain peculiar properties have long been attributed to the menstrual blood, upon the existence of which certain most extraordinary assumptions have been founded. One of these views attributes poisonous properties to the menstrual blood, etc. It has been observed that menstrual blood coagulates less readily than other blood, it is also said to possess a peculiar odour, but by no means of the same character in all individuals. These and similar observations, accurate in the main as far as they go, are of no particular importance in other respects, inasmuch as the difference between menstrual blood and the menstrual fluid has not been sufficiently attended to. The blood discharged during menstruation differs in no respect from ordinary blood, if obtained free from all extraneous matter, but immediately it escapes from the uterine vessels it becomes mixed with mucus, a larger quantity of which it meets with in the vagina. This secretion having an acid reaction, impedes coagulation, and the peculiar odour already alluded to, which the discharge finally attains, is due to the secretion of the sebaceous glands of the external organs of generation.

Our knowledge with regard to the sources of the menstrual flow is still uncertain. The blood is seen to trickle slowly out of the orifice of the uterus, probably its escape goes on at the same rate as its secretion. If we exclude for the present certain pathological observations (hæmatometra with accumulation in the tubes), the reports of cases of persons who have died during menstruation justify the conclusion that the menstrual flow comes from the uterine mucous membrane, and that menstruation therefore is a function of the uterus the cause of which we have yet to ascertain. On an inverted uterus the blood has been observed to escape from the immediate proximity of the orifices of the utricular glands, apparently in single small drops, which become free on the surface and subsequently coalesce, so that the whole mucous surface is covered with sanguineous

fluid. These observations give us some notion of the manner in which the blood escapes, but we must not forget that the circulation is very much disturbed in a uterus thus pathologically displaced. Generally speaking we have to depend upon the reports of the autopsies of those persons who have died, more or less suddenly, during menstruation. In these cases the results of examination are upon the whole tolerably constant. Virchow found the mucous membrane in a state of hyperæmia, and the blood apparently escaping in single drops. The uterine mucous membrane is succulent and swollen, in a word, its condition is that of acute catarrh. The most recent investigations by Kundrat* on this subject agree in their results with the foregoing, but they are still more minute, and therefore of greater importance. According to his description the mucous membrane of the uterus during menstruation is swollen, from three to six mm. thick, very much relaxed, and soft almost to liquefaction, in addition puffy, and covered with whitish, often bloody, mucus. The membrane is injected, and uniformly reddened. The orifices of the follicles are very distinctly visible, being surrounded by projections of the relaxed stroma, causing them to appear as sunk, funnel-shaped depressions. The turgescence commences slowly to appear before the actual escape of blood, when it reaches its highest point, and subsides as slowly after this has taken place. On microscopical examination Kundrat found fatty degeneration to a slight extent of the cells of the interglandular tissue, these being very turbid, and containing globules of fat. The vessels and epithelial cells of the glands were also found to exhibit this slight degree of fatty degeneration. All these alterations, the swelling, turbidity, and increase of the cells, were confined to the superficial layer of the uterine mucous membrane, the deeper layers containing the bases of the glands appeared normal. In the mucus covering the surface Kundrat found numerous detached epithelial cells.

This description agrees in the main with those of all the earlier observers with regard to the similarity existing between the changes in the mucous membrane of the uterus at the time of menstruation, particularly before the appearance of the flow, and those which attend the formation of the membrana decidua at the commencement of pregnancy, so that for a long time

* Stricker, Medicinische Jahrbücher, 1873, vol. ii.

menstruation has been regarded as pregnancy on a small scale, as a preliminary stage for the development of the ovum. At the outside a graduated difference between the decidua menstrualis and the decidua graviditatis is all that can be demonstrated. This, however, must be borne in mind, that the formation of the decidua, at least the incipient stages of such a process, goes on at intervals of about four weeks, quite independently of impregnation.

The phenomena of menstruation, as just described, were even in early times supposed to have a certain connection with the ovary (Chéreau),* at least as far as the discharge of blood was concerned. This latter was well known not to occur when the ovaries were absent, or in cases where they had been removed; and in those instances in which they formed part of the contents of a hernial sac they were found to be swollen and tender during menstruation. However great was the tendency in former times to connect menstruation with the development of the ovary, Bischoff's discovery of the periodical maturation of ova marked an epoch, and appeared thoroughly to elucidate the connection between menstruation and the previously unknown function of the ovaries. Bischoff's theory has become so completely interwoven with medicine as to require no exhaustive exposition here. What he proved is that at each menstruation a follicle maturates, tumefies, and bursts, that the ovule then escapes and a corpus luteum commences to form. This physiological law must still be considered to hold good, although the process is by no means so clear as would appear to be indicated. On the other hand, we shall endeavour in the following pages to show that up to the present time no facts have been adduced sufficient to upset this doctrine. Although Bischoff also proved that exceptions occurred, for example, that a follicle did not always really burst, and although in particular he expressed himself very carefully with regard to the relationship subsisting between the discharge of blood from the uterus and the processes going on in the ovary, the theory of this connection between menstruation (*i.e.* the escape of blood) and ovulation was very soon formally adopted by Gendrin, Négrier, and others, and the custom at once arose of regarding menstruation and ovulation as the same thing, as involving the same physiological process.

* Mémoires pour servir à l'étude des maladies des ovaires, p. 33.

Bischoff laid great stress on the view that menstruation might be only a symptomatic process of ovulation, that this latter might occur without discharge of blood, and possibly *vice versâ*. In spite of this, however, the relationship between the two phenomena was very soon, as I have said, generally regarded as a causal one, that is, ovulation was considered to be simply the consequence of menstruation, or indeed, it might be the cause. The two processes, however, can never be regarded as cause and effect. The menstrual flow may possibly promote the bursting of the Graafian follicle, but is by no means necessary for its occurrence, and there is still less ground for the notion that the escape of the ovum induces the flow. Whether ovulation and menstruation are the ordinary consequences of one and the same process, a periodically recurring congestion of the genital organs, may remain for the present an open question; at any rate it is certain that ovulation occurs without menstruation, but it is difficult to show that the converse holds good. That ovulation takes place without menstruation is a fact which has been long and universally recognised. The best proof that ovulation has been going on is the occurrence of pregnancy, which has been occasionally found to happen in young girls before the appearance of menstruation; our literature, moreover, abounds with cases of women who have borne several children without ever once having menstruated. There are also very frequent instances of conception occurring in women in whom menstruation had been checked by chlorosis or anæmia; the most common examples of this kind are cases where women suckling children have again become pregnant before the recurrence of menstruation. Lastly, I may mention those rare cases, such as have been observed by Deshayes of Rouen,* in which a woman fifty years old bore children two years after the regular cessation of menstruation.

That menstruation occurs without ovulation is by no means so easy to prove as the converse of the proposition; on the contrary, we must adhere to the statement that regular discharges of blood from the uterus, occurring at equal intervals of time, and recurring through a long period, do not take place unless the ovaries are present. We may therefore assert further that ovaries, and indeed a functionally active state of these

* Gaz. hebd. 14, ix. 1873.

organs, form a necessary part of our idea with regard to the menstrual flow, that according to Bischoff's experiments a regularly recurring menstrual discharge is connected with ovulation, and that therefore this latter is an essential part of menstruation. Many objections have been raised against this, particularly in recent times by Beigel, but they are insufficient, in my opinion, to destroy the truth of the proposition.

In the first place, there have been repeated instances in which a ruptured follicle has been sought for in vain in individuals who have died during menstruation. Kölliker, in examining ten cases where death had thus taken place, found the corpus luteum absent in two. Similar observations have been made by Ashwell, Paget, and others. Apart, however, from the question whether in all these cases the discharge was really a menstrual one, that is, one occurring at least at the proper time, and not of merely accidental origin, the occurrence of similar instances had already been noticed by Bischoff. In these cases we can easily imagine that rupture of the follicle does not take place, possibly because it lies more deeply embedded than usual in the stroma of the ovary, and that it then perishes through progressive metamorphosis. Such instances are to be found at times in the normal ovary according to the observations of Slaviansky, and are to be regarded as physiological.

The view is generally accepted that no ovulation takes place during normal pregnancy, the only anatomical proof of which in the ovary is the formation of a true corpus luteum. This, however, is not always present, and is even said to have been occasionally found where pregnancy was absent.* The peculiar growth, of which the true corpus luteum consists, is to be explained by the great copiousness of the supply of blood to the ovary during pregnancy. If regular ovulation were to take place during the whole of pregnancy we should not be able to understand how it is that all the ruptured Graafian follicles do not undergo the same metamorphosis, and we should expect to find regularly several true corpora lutea. The fact is well known that in many women, during the early months of pregnancy, a discharge occurs very similar to menstruation, in some, indeed, it takes place during the whole duration of pregnancy, and lastly Stein and others have observed that some women have

* *Edin. Med. Journal*, Aug. 1873.

never menstruated except when they were pregnant. All these more or less rare instances cannot at any rate be adduced as proof that menstruation occurs without ovulation, for it has never been clearly specified on what grounds these discharges are to be regarded as menstrual, and in cases where they occur at the usual menstrual periods, there is always the possibility of the occurrence of ovulation. It is at least possible that if such cases were to be closely observed, and an opportunity arose of making a post-mortem examination after delivery had taken place, marks of several corpora lutea would be found, so that cases of this kind would especially support the view that menstruation does not occur without ovulation, at any rate they could not at present be quoted as demonstrative evidence to the contrary.

The doctrine of pseudo-menstruation has led to the greatest confusion in the views held with regard to menstruation. The former term has been applied to hæmorrhages from the uterus, occurring under various circumstances, and characterised anatomically by absence of rupture of a Graafian follicle. If the term menstruation were to be generally applied to these discharges, it would be saying in other words that menstruation was independent of ovulation, that is, that it occurred without it. In these cases, however, the symptoms are at any rate not those of menstruation but principally of uterine hæmorrhage, and the whole subject would be rendered clear if we were to speak of these simply as hæmorrhages, discarding the term pseudo-menstruation. The frequent assertion of aged persons suffering from carcinoma uteri, to the effect that their "courses have re-appeared" after an interval of cessation, is not regarded by the physician as any real evidence of menstruation, and with just as little truth could it be said of hæmorrhage during an attack of cholera or typhoid that menstruation had suddenly appeared at an unusual time. In the meantime we must strictly persist in regarding as menstrual only those uterine discharges which occur regularly at certain intervals, generally at the same time of every month. Post-mortem examination reveals so distinct a difference between the so-called pseudo-menstrual hæmorrhages and menstruation proper, that any comparison between them appears quite out of place. In the pseudo-menstrual processes the uterine mucous membrane, as

has been best described by Virchow, is not only much swollen and hyperæmic, but, as a further point of distinction from the same membrane during menstruation, it presents in a marked degree all the appearances of hæmorrhagic catarrh, inasmuch as blood is found extravasated in the mucous membrane. From simple uterine hæmorrhages these processes can certainly be distinguished by the simultaneous occurrence of changes in the ovaries. These organs are usually traversed by extravasations of blood, which sometimes occur on the surface in the peritoneal covering. Single follicles are found filled with blood. These were not found by Virchow to be ruptured, and this he considers the principal difference between true and false menstruation. These appearances most frequently occur in cholera, typhus (abdominalis), and small-pox; in these diseases they are seen in women who have already reached the climacteric period, and even in little children. Uterine hæmorrhages such as occur in women at the age of puberty are not characterised by the ordinary intervals of menstruation, and are for the most part less copious than the normal discharge.

These hæmorrhages occurring in febrile affections were classed by Gubler* with the bleedings from the nasal mucous membrane, etc., which are seen in the same disorders. The appearances in the ovary show, as already mentioned, that these are not simple uterine hæmorrhages anatomically considered. Perroud† properly draws attention to these cases, and in the course of his work comes to the conclusion that no ovulation occurs in these hæmorrhages, and that they are therefore not to be considered as instances of real menstruation. These processes have been lately studied with the greatest minuteness by Slaviansky in cases of cholera.‡ These investigations prove distinctly that neither the changes in the ovaries nor in the uterine mucous membrane at all resemble those which occur in menstruation, the discharge of blood from the uterus and vagina being the only thing which serves to remind us of that process. Slaviansky consequently entirely rejects the notion of pseudo-menstruation, although in a work which has recently appeared, and to which we shall have to allude, he seems to consider that

* Mém. Soc. biol., 1862.

† Lyon medical, 1871, No. 16.

‡ Archiv f. Gynäkol, vol. iv. p. 285.

these processes influence in a certain way the discharge of ova. Slaviansky found that in cholera, thickening and relaxation of the uterine mucous membrane were almost constant appearances, and that there was also frequently a considerable amount of extravasated blood. These extravasations were found to a varying extent throughout the entire thickness of the mucous membrane, causing superficial destruction; occasionally they were situated in the deeper layers of the mucous membrane, and then produced a partial separation, the membrane remaining apparently normal on the internal surface. It is evident that contractions of the uterus, hæmorrhage, etc., are the necessary results of such conditions. In a few cases, extravasations of blood, smaller in size, were found in the muscular substance of the uterus itself. It is certain that in all these cases the appearances were not those of the menstrual process, but of metrorrhagia, due to acute hæmorrhagic inflammation of the uterine mucous membrane. The various acute morbid conditions of the ovaries found by Slaviansky in typhus, cholera, and septicæmia, correspond to the already recognised type of parenchymatous inflammation of the ovary with extravasation of blood.

It is scarcely necessary to offer any further explanation in order to show that these symptoms which have been unfortunately designated by the term pseudo-menstruation, have nothing whatever to do with the normal process, and that they cannot therefore be adduced as evidence that menstruation occurs without ovulation, the only proof of which would be the regular occurrence of a sanguineous discharge from the uterus in cases where the ovaries are absent. As far as our present knowledge extends, and Puech's* interesting work confirms past experience, it may be considered definitely established that menstruation has never been observed in cases where the ovaries were congenitally deficient or imperfectly developed. On the other hand, cases have certainly occurred in which menstrual discharges have taken place after the removal of both ovaries. These cases have lately been regarded by various authorities as distinctly proving that menstruation has nothing in common with ovulation.

It must, however, be mentioned with regard to this point,

* Puech, Des ovaires de leurs anomalies. Paris, 1873.

that not only where the ovaries are absent or imperfectly developed has menstruation never been observed, but we also find that cases where both ovaries are diseased or have been removed, are characterised, as a general rule, by the cessation of the catamenia.

In recent times exceptions to this rule have been adduced in which menstruation has continued after the removal of both ovaries, or in cases where both these organs were diseased. From these, however, a certain number of cases must be subtracted in which, after the operation had been performed, hæmorrhage from the uterus occurred once or even several times, and never again re-appeared. Spencer Wells, for example, has described such cases, and has considered them as uterine hæmorrhages (epistaxis) and not as instances of menstruation. Cases have also been noticed by Bailly (Traitement des ovariotomisées) in which six weeks after extirpation of both ovaries profuse uterine hæmorrhage took place and recurred after four weeks, but never re-appeared. It was shown by Bailly that the patient was suffering from chronic metritis and erosion causing hæmorrhage. The cases reported by Clay and others are equally insufficient evidence of real menstruation after extirpation of both ovaries, the more so because they were not regarded by the authors as instances of the normal process. Of more importance in this respect are Atlee's * cases. Of those reported by him, under Nos. IV. to VIII., two may be at once struck out as in no way demonstrative. One of these is case V., inasmuch as after extirpation of both ovaries, there were only the molimina menstrualia (pains in the loins and headache) and fluor albus, recurring certainly at monthly intervals. The other is case VIII., in which after extirpation of one ovary the other became diseased, but was not removed, and menstruation went on; this case will be subsequently alluded to. There remain, therefore, three of Atlee's cases in which after the removal of both ovaries menstruation went on regularly for years. A similar case of Jackson's has been communicated by Beigel, in which menstruation went on for twenty months, until the climacteric period was reached. It seems to me that these and similar cases are by no means sufficiently demonstrative to upset the physiological law based on good observations, that

* Diagnosis of Ovarial Tumours. Philadelphia, 1873, p. 35.

menstruation is connected with the functions of the ovaries. Cases in abundance have been reported, and lately most exhaustively discussed by Leopold, in which the catamenia regularly appeared though both ovaries were diseased. For such cases we may assume that those parts of the ovary necessary for its function, *i.e.* those concerned in forming the ova, are still present, an assumption supported by direct microscopical examination, for with tumours of the kind there is often a sufficient remnant of normal ovarian tissue with Graafian follicles; an assumption, moreover, the truth of which is absolutely proved by cases in which both ovaries were diseased, and yet conception occurred, and where, consequently, the production and discharge of ova must still have been going on.* With these cases is connected one of Atlee's, No. VII., in which the patient menstruated regularly after the extirpation of one ovary. The other ovary then became diseased, and was punctured eleven times. The patient became pregnant after the second puncture, and was finally delivered of a living child, three more punctures having been made during the pregnancy. The second ovary was afterwards also removed, and menstruation continued to go on. Atlee's eighth case is also an exception, inasmuch as the patient not only menstruated regularly, but also became pregnant after one ovary had been removed and the other had become diseased. The second ovary was not removed. These cases clearly show how small an amount of ovarian tissue is sufficient for the production of ova, a fact quite intelligible on histological grounds. It seems to me that a consideration of all these cases, extracted from American literature, of menstruation continuing for years after removal of both ovaries, amply justifies the question whether there might not have been some remains of normal ovarian tissue left behind, and which could continue to discharge its peculiar functions. That such a thing might occur certainly seems possible when we consider the often peculiar formation of ovarian tumours and their relations to the broad ligaments, and also the great operative difficulties of ovariotomy so frequently experienced. There are no minute anatomical examinations of the cases above referred to, and with regard to this I may draw

* Spiegelberg, Monatsschr. f. Geburtsh, xxx. p. 380; Leopold, Die soliden Eierstocksgeschwülste, Archiv f. Gynäk, vol. vi. Table ii. Nr. 16.

attention to a remark of Waldeyer's,* who occasionally found a small remnant of normal ovarian parenchyma just where the pedicle of the tumour passed into the wall of the cyst. In one case Waldeyer was even able to demonstrate several well-formed corpora lutea near the insertion of the pedicle, also vesicles which must be regarded as Graafian follicles, certainly without evidence of ova.

In the absence, therefore, of minute investigation into the anatomy and histology of such cases, they cannot be quoted in support of the assertion that there is no kind of connection between ovulation and menstruation. Atlee himself considers that the discharges are a function of the uterine mucous membrane, a customary one, so to speak,—an explanation which is certainly not worthy of the name.

Leopold, in his work already referred to, mentions cases of disease of both ovaries with regular menstruation, in which on examination no normal tissue was said to have been found. Herz's case of sarcoma of both ovaries† cannot however be turned to any account in this respect, for its history is only to this effect: "Mrs. M. S., aged 38, had menstruated regularly since her eighteenth year. She had been confined six times since her twenty-eighth year," etc. The further history of the case—it appears to me to be by no means definitely described—is to the effect that menstruation went on regularly while the ovaries became diseased, at least there is no further stress laid upon this point. Spiegelberg's‡ accounts are of a different kind. He met with two cases of disease of both ovaries with regular menstruation (in one certainly occurring every 14 days), and yet in neither ovary could he discover a Graafian follicle, at least not one in a normal condition. In this case it was not probable that any normal follicles were overlooked, and if so, it is the first in which it was positively proved that regular menstruation can go on at monthly intervals in the absence of any ovarian parenchyma; there was however just this possibility, that the whole tissue of the ovary was not invaded by disease until just after the last appearance of menstruation. Although after what has been said the facts just mentioned do not appear

* Arch. f. Gyn., vol. i.

† Virchow's Arch., Bd. 36.

‡ Monatsschr. f. Geburtsh., Bd. 30, p. 440.

to me sufficient to prove that no kind of connection exists between menstruation and ovulation, it must however certainly be acknowledged that this connection has been by no means clearly or absolutely established, at least that we are unable to point out the way in which it exists.

We can therefore easily understand the attempts recently made to establish more closely the connection between ovulation and menstruation. This question has again been thoroughly discussed by Pflüger. Mainly from theoretical considerations he adopts the view, which, however, the histological investigations of Virchow, Pouchet, and others had already established as a fact, that the change of the uterine mucous membrane in menstruation was the incipient stage of the formation of the decidua. Pflüger's comparison of these processes with the excitement which the surgeon causes in plastic operations does not appear to me to be a peculiarly happy one, for the connection between the ovum and the uterine mucous membrane has no analogy with the adhesive process due to the formation of a cicatrix. More interesting than this idea of the phenomena of menstruation, which in point of fact, as already mentioned, were long ago ascertained, is Pflüger's hypothesis with regard to the connection between ovulation and menstruation. He however very properly insists that a simple causal connection between these two processes does not exist, but his theory is that the constant growth of cells in the ovary is a continually increasing source of excitement to the nerves of the organ. When this stimulus has reached a certain degree of intensity violent congestion of the genital organs occurs from reflex action. This congestion induces on the one hand the menstrual flow, and on the other rupture of a Graafian follicle, so that, according to Pflüger, ovulation and menstruation have one common cause, viz. the congestion of the sexual organs due to reflex action. This hypothesis explains in a peculiarly satisfactory manner the periodicity of the whole process, but is of little value as an explanation in other respects. There are no other facts to support it. The only instance possibly in its favour, in my opinion, is the peculiar condition of menstruation observed in the two Hungarian girls. These two individuals, as is well known, were attached to each other by their backs; they menstruated very frequently at different times, though it was shown

on post-mortem examination that the abdominal vessels of both communicated with each other, and that consequently the circulation was common to both. This case might at any rate prove the dependence of the succession of the phenomena of menstruation upon the ovaries. In the very similar instance of malformation called the "two-headed nightingale," which has lately been exhibited, menstruation occurs simultaneously on both sides. This fact is however without value at present, for it has not been positively ascertained whether this individual has one or two sets of sexual organs. The attempt has recently been made by Beigel to upset the theory of a connection existing between ovulation and menstruation, and Slaviansky's* investigations induce him to adopt the old view that the maturation of ova is not a periodical process, but that the ova are set free by coitus and other conditions of congestion, as, for example, the congestion in menstruation, supposing that at the moment in question a mature follicle is just ready. The characteristic feature of a mature follicle, according to Slaviansky, is that its histological structure is completely defined, and he therefore adopts the view that even in children at a very early age a continuous ripening of single follicles takes place just as in adults. (This, by the way, quite destroys Pflüger's theory with regard to the menstrual discharge.) According to Slaviansky the difference between the maturation of the follicles in children and adults consists in this, that in the former there are never any traces to be found of rupture. The follicles of the child's ovary are deeply embedded in the stroma and are covered by a thick stratum of the cortical layer. In the child the mature follicles perish by retrogressive metamorphosis, rupture takes place only when menstruation occurs, or when the ovary becomes congested from other causes; for instance, during coitus, in febrile diseases or in cholera, just at a time when a follicle happens to be mature. Even in adults the great majority of the follicles perish from atresia and not by rupture. Menstruation is a process entirely independent of the development of the follicle, over which latter process it exercises equally little influence.

Apart from the fact that in this last work of his, Slaviansky absolutely recants that which he had stated to be the difference

* Archives de Physiologie, 1874.

between menstruation and pseudo-menstruation, at least he connects these two processes very closely together, it certainly seems to me that no new facts have been adduced to compel us to return to those old views which have been already controverted by Bischoff, Négrier, Coste, and others. Slaviansky's histological investigations with a view to proving the ripening of the follicle must, as a matter of course, be referred to the more expert, but the question of ovulation not only refers to the ripening of the follicle, but deals more particularly with the rupture thereof, that is, the escape of the ova, which, according to Slaviansky's investigations, is a purely fortuitous occurrence.

Bischoff's theory, by no means as yet set aside, that at the time of each menstruation an ovum escapes from the ovary without any external influence, offers a basis for the most recent, and, as it seems to me, the best supported attempt to explain the connection between ovulation and the menstrual flow.

Soon after the time when the changes in the uterine mucous membrane at the time of menstruation came to be regarded as formation of the decidua, and the slight and gradual difference between the decidua vera and decidua menstrualis came to be recognised, the question arose as to what became of this swollen uterine mucous membrane when impregnation did not take place, when no use was made of the receptacle thus prepared. We know that Pouchet's view was that the swollen mucous membrane was extruded during the interval between two menstruations as a mass of mucus, a view which has never been confirmed by observation. That the mucous membrane would again become swollen was a fact with which inquirers were satisfied. There were certainly occasional expressions of opinion to the effect that the menstrual discharge might possibly be connected with this decay of the decidua menstrualis, in other words that the hæmorrhage from the uterine mucous membrane might be the result of simple escape from the vessels as already described.* (Compare on this subject also Pflüger, *l. c.*) As far

* In an article by Aveling, *Obstetrical Journal*, July, 1874, p. 213, I find the remark that Dr. Power's view is that the menstrual hæmorrhage comes from the raw surface of the uterine mucous membrane after the decay of the membrana decidua. Power's words are, "a woman menstruates because she does not conceive."

as I know, Dr. R. Sigismund is entitled to the credit of having advanced a definite theory, though certainly only in the form of an unproved hypothesis. His view is that the swelling of the uterine mucous membrane and the discharge of the ova are two simultaneous processes independent of each other; that the swelling of the uterine mucous membrane is therefore always the first stage of the gravid state—a view undoubtedly correct, as previously explained—that if the ovum, which has reached the uterus, be not fructified, decay of the mucous membrane by retrogressive metamorphosis is the result, the membrane being thrown off as detritus, and this process going on in the uterine mucous membrane causes injury to numerous vessels, and thus produces the menstrual discharge.* According to Sigismund, therefore, the menstrual hæmorrhage is a sign that the ovum of that period has perished. This view at first appeared extremely well adapted for the explanation of numerous difficulties with reference to the relationship of ovulation to menstruation; but the facts in support of it were too few, it was too hypothetical to meet at once with general approbation, although there are but few objections which can be brought against it.

Löwenhardt,† in his investigations with regard to the duration of pregnancy, has confined himself to the examination of actual facts, for he has endeavoured to show that in reckoning pregnancy we must not take as its starting-point the last occurrence of menstruation, but that the ovum of that menstrual period which failed to occur is always the one which becomes fructified. According to his calculations impregnation occurs before the expected commencement of the menstrual flow, consequently before the hæmorrhage should show itself, and, perhaps, from five to eight days before the next expected period. The ovum then fructified reaches the uterus, where the mucous membrane is already becoming swollen, and the decidua in process of formation, and where nothing opposes its further development. The uterine mucous membrane goes on swelling, does not bleed —menstruation fails to appear. It would take me too far from my subject to recapitulate all the calculations which have led to this view, or to illustrate them by observations of my own; these I reserve for another opportunity. Reichert has also

* Berliner klin. Wochenschr., 1871, No. 52.

† Archiv f. Gynäkol, Bd. iii.

expressed the same views with regard to these conditions with particular clearness, and in a very convincing manner. (Description of an Aborted Ovum, etc., "Transactions of the Berlin Academy of Sciences," 1873.)

In fruitful menstruation there are, according to Reichert's explanation, two primarily essential acts, the escape of a mature ovum, and the formation of the decidua menstrualis, as the introduction and preparation of the womb for the formation of the decidua vera and reflexa (Fruchtkapsel). Now if the ovule which has been set free becomes fructified only after hæmorrhage has taken place, consequently, after the appearance of menstruation, as is commonly supposed, this must wait for its further development until the next formation of the decidua, that is, until the next menstrual period. Therefore, as Reichert very properly urges, two successive menstrual periods are required for the process of propagation to become complete, one supplies the ovum, the second provides for its incapsulation, and therefore in the last, the ovum, and in the first, the decidua menstrualis is wholly superfluous. If, on the contrary, the theory be adopted that the ovum which escapes at the time of menstruation then and there becomes fructified, and, as a result, the decidua menstrualis becomes perfected and transformed into the decidua vera, causing the menstrual flow to fail, it follows that only one menstruation period is necessary for the process of propagation. The menstrual discharge would, therefore, only occur when the ovum has not been fructified. The opinion formerly held, and, strictly speaking, the one which now obtains, that the menstrual flow is a sign of ovulation, and that after this had occurred fructification of the ovum could take place, assumes the truth of the theory described by Löwenhardt as preposterous, that the changes in the uterine mucous membrane, the formation of the decidua, must be repeated eight or ten days after menstruation if fructification occurs, for it is a well-known fact that all signs of the decidua menstrualis disappear almost immediately after hæmorrhage has taken place. Reichert thus definitely describes the result of his embryological investigations:—"That the escape of mature ova, and the preparation of the uterus by means of the decidua menstrualis for the incapsulation of the fœtus, take place only during the period of menstruation, and that the incapsulation of the fœtus depends upon a

definite state of its formation, and, as a consequence thereof, invariably occurs at the expiration of a regular period of time after previous impregnation of the ovum." This condition can only be fulfilled if the completion of propagation is connected with a menstrual period, as above explained. This theory of the relations existing between ovulation and menstruation, or rather the menstrual discharge, is supported in the most striking manner by Kundrat's recent anatomical investigations with regard to the menstrual process (Kundrat and G. I. Engelmann: Untersuchungen über die Uterusschleimhaut. Medicinische Jahrbücher von Stricker. Wien, 1873). We have already alluded to the results of these histological investigations into the structure of the uterine mucous membrane during menstruation, and they show that acute swelling takes place, that the membrane, in fact, is in a state of catarrh. When hæmorrhage occurs there is fatty degeneration of a slight degree of the superficial layers, and the secretion contains numerous detached epithelial cells, portions of the orifices of the glands, etc. These changes are not independent of the hæmorrhage, but they are really the cause of it. The destruction of the superficial layer of the uterine mucous membrane produces a raw surface, and hæmorrhage is the consequence. The menstrual congestion by itself only tends to the formation of the decidua menstrualis, the destruction of the decidua causes the hæmorrhage. Analogous to this are the conditions of the decidua during pregnancy, where the intense hyperæmia is not in itself found to produce hæmorrhage, this occurring only at the termination of the period, when delivery takes place, and being due to fatty degeneration of the decidua. In menstruation the blood is only found superficially upon the mucous membrane of the uterus, corresponding to the fatty degeneration in the upper layers in which a large portion of the epithelium of the glands and surface undergoes disintegration. If the hæmorrhage were the direct result of the hyperæmia, extravasations of blood in the deep layers of the decidua would be of much more frequent occurrence. Kundrat agrees with Sigismund and Reichert in the opinion, that according to the received theory which supposes that the bleeding takes place simultaneously with, or as the cause of, the ejection of the ovum, it would be difficult to suppose how this latter could become impregnated and fixed

when the mucous membrane was partially disintegrated, a theory the difficulties of which are not removed by Pflüger's illustration borrowed from surgical processes for purposes of inoculation. The result of histological examination is the establishment of the fact of the retrograde metamorphosis of the decidua menstrualis during and after the hæmorrhage, and it is only slightly probable, at any rate not proved, that a second formation of the decidua should be caused by conception. There is no difference between the decidua menstrualis and the uterine mucous membrane at the commencement of pregnancy. The menstrual swelling is, therefore, only the preparation for conception, the escape of the ovum is subsequent to the swelling, and always precedes the menstrual flow, the occurrence of which is prevented by conception, for when that takes place the mucous membrane undergoes further development instead of disintegration.

The disintegration of the decidua menstrualis being thus anatomically demonstrated, all objections against the hæmorrhage being regarded as the consequence of this process are therefore invalidated.

Hausmann's opinion was that the menstrual fluid contained too few elements to indicate retrogressive metamorphosis of the decidua. He found it to contain cylindrical epithelium of the uterine mucous membrane and glands, and this proves the correctness of Kundrat's observations as to the superficial disintegration of the mucous membrane, the deeper layers (glandular layer, Friedländer) of which remain intact.* Pathological conditions, such as occur in dysmenorrhœa membranacea or extra-uterine pregnancy, cannot be brought forward as evidence in any way against these observations, and the more so because, on the whole, the condition of the uterine mucous membrane in these affections is quite in accordance with what this theory would lead us to expect. A further objection is deduced from the phenomena of heat or rut in certain animals, a condition in which, as is well known, impregnation occurs, and which is not seldom characterised by the occurrence of a bloody mucous discharge from the genital organs. But apart

* Nielander also found that the menstrual fluid contained the elements of the uterine mucous membrane, masses of cells corresponding to the glands (Solowieff, *l. c.*).

from the fact that these conditions have not been sufficiently investigated to admit of any comparison with menstruation, these animals (bitches and cows) have, as Reichert (*l. c.*) pointed out, no decidua menstrualis, and it has not been proved whether or not the bloody mucus comes from the points of attachment of the placenta.

All the foregoing statements may be thus summed up in a few words. There is no possible doubt as to the correctness of the theory of the periodical maturation of ova in the human ovary; and we know that each menstrual period, that is, each ovulation is accompanied by a formation of decidua in the uterus, this latter process not being dependent upon the ovulation, no demonstrable connection, at least, existing between them.

Reichert's careful investigations (*l. c.* p. 9) make it probable that extrusion of the ovum takes place only after the formation of the decidua menstrualis, and that the menstrual flow only occurs when the liberated ovum is not impregnated.

The connection between the menstrual flow and ovulation would consequently be that the advent of the former indicates that the latter has taken place, but that the ovum has not been impregnated.

Menstruation fails to occur when the ovum has been impregnated, its appearance being due to superficial disintegration of the decidua in the absence of impregnation.

It would take me too long to show how admirably this theory of the processes of menstruation is adapted to remove many of the difficulties already described which beset the commonly received opinions on this subject. As regards practice, this theory will of necessity cause some change in our present method of computing the time of pregnancy, whilst on the other hand, the certainty of the calculation will afford a test of the correctness of the theory. These are points, the complete discussion of which I must reserve for another opportunity.

In dealing with the second portion of my subject, viz. those disorders of the menstrual processes to which the term Dysmenorrhœa is applied, I shall follow the custom which indi-

cates how prone we are, even in the present state of our knowledge, to regard symptoms rather than the actual nature of the disease. Painful menstruation can, as a matter of course, only be a symptom of some kind of disorder in some portion of the genital canal; we therefore apply this term substantially to those painful attacks occurring during menstruation, the causes of which are not readily obvious, excluding from the category all decided forms of internal disease, such as are due to inflammation, change of position, etc. If we thus limit the use of the term Dysmenorrhœa, and, as formerly, consider it to be an independent affection, we shall find that two characteristics are, almost without exception, common to all the cases, notwithstanding the infinite varieties of exciting causes. The first of these is that the dysmenorrhœic troubles are most violent and of most frequent occurrence in young people at the commencement of puberty, and that, therefore, the number of those patients in whom dysmenorrhœa comes on later, or is of long duration, is very small indeed in comparison with the number of those who suffer from violent attacks of pain in the first years of menstruation, and which gradually subside as time goes on. To this we may add, that this form of dysmenorrhœa always seems to pass away after conception and delivery. The other symptom common to all is that the attacks of pain not only commence, but even reach their acme before the discharge appears, so that with the hæmorrhage (menstruation) there comes the feeling of relief. We shall see that an explanation of these symptoms is to be found in the nature of the various forms of dysmenorrhœa, and that all these cases are due to faulty development of the genital organs, and that they may or may not be associated with defective development of the entire organism.

In order to understand these conditions and their therapeutics, it is important to distinguish two principal forms. In the first class will come those cases of dysmenorrhœa in which ovulation is painful, and all the symptoms originate from the ovary; these cases may be designated as ovarian dysmenorrhœa. The second class comprehends those cases in which the excretion, the discharge of blood from the uterus is the principal cause of the pain; such cases may be best described as uterine dysmenorrhœa.

The first group, that comprising ovarian dysmenorrhœa or painful ovulation, is best illustrated, as it were experimentally, by those cases of defective development of the uterus in which that organ is without a cavity, and menstruation consequently fails to occur, but where the woman is of full development and where the existence of the ovaries can be satisfactorily demonstrated. Cases of the kind are not rare, and we generally find that such patients suffer from most violent attacks of pain, at intervals of three or four weeks, in the lower part of the pelvis, the pain more or less resembling that of peritonitis, and associated with vomiting, the subsequent attacks being often complicated by febrile symptoms, and exudations in the pelvic cavity being often discovered on examination per vaginam or rectum. Then we frequently have the occurrence of all those symptoms known as Pelveo-peritonitis hæmorrhagica, and these are very violent, resembling more or less completely those known as colica scortorum (colic of prostitutes). The difference between the two sets of symptoms is, that in the malformation before us the symptoms of inflammation in the pouch of Douglas are primarily due to the menstrual swelling of the ovary, there being no means of depletion by the usual channel, that is, the menstrual discharge, the usual consequences being inflammatory conditions of the ovary, oophoritis and perioophoritis. Then comes the rupture of a vesicle in the ovary in a state of chronic inflammation, and, as a very probable consequence, extravasation of blood into Douglas' pouch. The symptoms thus become more and more aggravated until they lead to general peritonitis, or until the ovary imbedded in masses of exudation matter shrivels up and perishes, and the production of ova ceases. In colica scortorum the symptoms have an opposite course. Pelveo-peritonitis, with subsequent agglutination of the pelvic organs to each other and displacement of the ovaries, etc., is produced by the mechanical injuries, which are not wanting even during menstruation, and the noxious influences of the most diverse kinds to which these women are at this time exposed. This offers a ready explanation of the attacks of pain occurring at each menstruation, and also of the well-known sterility of common prostitutes. The treatment of these dysmenorrhœal attacks due to imperfections of the uterus can, as a matter of course, be only a symptomatic one,

unless we adopt the plan recommended by R. Battey, of Atlanta, Georgia,* and extirpate the ovaries, and thus remove the cause of the affection. Such an operation might be had recourse to in cases of this kind, which are certainly of rare occurrence. In cases where the uterus is defective, that is, rudimentary, the ovaries are at any rate completely superfluous organs, and their removal is of no consequence. Our present experience teaches us that, owing to the smallness of the wound, the removal of both healthy ovaries is a procedure attended by no danger, as compared with the suffering and risk which such a malformation must cause. Practically, however, considerable difficulty will be experienced in choosing the time for this operation; if we wait until there have been repeated and severe attacks of pelveo-peritonitis, the removal of the ovary from the surrounding masses of exudation will be both difficult and dangerous. If, on the other hand, the symptoms are less intense, there will be the less reason for so serious an operation, for, as is well known, it often happens that imperfect formation of the ovary is associated with rudimentary development of the uterus.

In this class of ovarian dysmenorrhœa must also be placed a large proportion of those menstrual disorders so excessively common at the commencement of puberty. The more or less intense pains, which so many young girls experience every time menstruation occurs, not only during the first months, but even for some years, usually before the discharge appears, or during its continuance, for the most part evidently on both sides of the uterus and extending from the loins to the thighs, associated with peritoneal irritation and vomiting—these pains in cases where the position of the uterus is normal have always been referred to the ovaries. The theory is that the commencement of ovulation is attended with difficulties by reason of the peculiar closeness of the stroma of the ovary or of the tunica albuginea. Inasmuch as the surface of the ovary is only partially covered by peritoneum, we must reject at once, as pure hypothesis, the idea that this investment possesses such an amount of consistence. There is much more reason for adopting the theory, based upon recent histological investigations, that in the cases before us, the single follicles are at a distance from

* Atlanta Medical and Surgical Journal, September, 1872.

the surface of the ovary, deeply imbedded in the stroma, or that the tunica fibrosa of single follicles is abnormally closely connected with the wall of the follicle, for, as is well known, the older follicles much more readily shell out of the stroma of the ovary than those of more recent origin. If we suppose this close tissue in the state of menstrual congestion we can easily understand the violent pains as a consequence of the dragging and tension, and also how it is that the depletion, the hæmorrhage from the uterus, partly relieves the symptoms. This theory then serves to explain the ordinary course of the symptoms. As a consequence of the repeated recurrence of the menstrual congestion, the resistance offered by the structures of the ovary is gradually overcome, ovulation goes on without difficulty and without pain; or if congestion is again set up, as it frequently is by coitus, the catamenia occur with rapidity and in a striking amount, and the marriage of the patients is found to cure their dysmenorrhœa. I must, however, expressly remark that I am now considering only those rarer cases of this kind where there is no abnormal condition of the uterus. However, if the symptoms just described become more intense at the period of ovulation, the difficulty perhaps especially severe, we then may expect the advent of really inflammatory conditions in the pelvis, perioophoritis with all its symptoms, and the consequences thereof may be, in a more or less marked degree, those troubles which we have above described as characteristic of ovarian dysmenorrhœa in cases of defective formation of the uterus. These pelveo-peritonitic adhesions and callosities which may form round the ovaries undergo resolution in favourable cases, but, unless this occurs, as a matter of course they increase the troubles in every subsequent menstruation, which is also injuriously affected by everything that produces congestion, especially by coitus, and in these cases we are very often called upon to treat more or less violent attacks of localised peritonitis occurring soon after marriage, and the consequence of which is often incurable sterility. In the description of this group of ovarian dysmenorrhœas I have considered only those cases in which the genital organs, and particularly the ovaries, exhibit no pathological defect, that is, where there are no indications of any original imperfection in the formation of these organs. The difference between these cases and those above described is

often very remarkable. Menstruation is irregular and imperfect, it either does not occur at all, or only in very slight amount at long intervals, or perhaps it may show itself a few times at the age of puberty and then finally cease. In the great majority of these cases, however, according to my experience, the menstruation is unattended by pain, or if any troubles do occur they are slight in character. The individuals are in general of a pronounced type of womanhood, but the genital organs are often remarkably backward in development, the labia majora and minora appearing as small folds of skin, the orifice of the vagina patulous, and the mons Veneris showing only a few hairs. The vaginal portion of the uterus is small, button-shaped, and short, the orifice being scarcely perceptible; its small size is easily discoverable on examination as well as by sounding, while, generally speaking, the ovaries are not to be felt, the difficulty being increased by the amount of adipose tissue which these individuals have a tendency to accumulate. This tendency often causes the breasts to appear fully developed, whereas the proper glandular parenchyma is present in very small quantity. This tendency to the formation of fat is a characteristic distinguishing mark between these persons and women of a masculine type, in whom as a rule the genital organs are quite normally developed. Whilst therefore defective development of the ovary is usually connected with a similar condition of the genital organs, the possible explanation of the rare occurrence of the violent dysmenorrhœas may be that there are here no great impediments or resistance to be overcome; all the functions of ovulation and menstruation are feebly performed, or remain in abeyance in consequence of the defective development.

If, in this way, by analysing separate cases, the attempt be made to gain an insight into, or perhaps only an idea of, the multitudinous varieties of the conditions of dysmenorrhœa, the experience of every physician will remind him of another and a numerous group of cases, which to some extent may be placed in the class of ovarian dysmenorrhœas; I refer to the disorders of menstruation in chlorotic patients. Although the connection between chlorosis and disorders of menstruation was long ago recognised, our knowledge with regard to it is still far from definite, and it must yet be studied more minutely. In those

chlorotic conditions of a transient character occurring in early life, there may probably be only some defective formation of blood, a peculiar form of anæmia, although we have absolutely no certain chemical or physiological knowledge with regard to this. The fact that in a large number of chlorotic individuals the peculiar symptoms disappear as time goes on may be mentioned as supporting this view. In these patients we most frequently observe that menstruation fails to appear, or that it is very irregular, but there may be a complete absence of any painful sensations. Dysmenorrhœa proper is, however, not very rare, and may certainly exhibit all the above described characteristic features. In these cases we may suppose that the ovaries are in this condition, namely, that their tissue is in other respects normal, and that there is no increase of resistance, but that the menstrual congestion itself is insufficient. At any rate, in the absence of any further complications, which is certainly the case as a rule, we see that as the chlorosis disappears, the menstrual processes cease to be painful.

Much more difficult to comprehend are those cases of profuse menstruation in chlorotic individuals, for they are unaccompanied by pain, but, according to my experience, only where there is no displacement of the uterus; these are, however, beyond the compass of our present examination. There now remains a second group of chlorotic cases, in which the symptoms and consequences of the chlorosis are permanent and incurable. The nature of these cases has been made intelligible and clear by Virchow's work on the connection between chlorosis and defective vascular development. As, according to Virchow, defective development of the genital organs is by no means always connected with this vascular hypoplasia, yet both conditions are sometimes found together, and in this case dysmenorrhœa is never absent. In a practical point of view it is at any rate important to recognise these cases, for it is vain to expect any good results from our therapeutical efforts, either as regards the chlorosis or the dysmenorrhœa.

In this last respect, however, mistakes have been especially frequently made. In these cases, that is to say, there is defective development, not only of the ovaries, but also, as a general rule, of the uterus. When this latter organ is formed as in the infant, its mouth is naturally small and narrow. If attention

be paid exclusively to this prominent symptom, the narrowness of the orifice of the uterus, and it be considered as the cause of the dysmenorrhœa, division of the orifice will then be recommended, but it will be a very unnecessary operation, and attended with no good results.

The principal points to be attended to in the treatment of the different forms of ovarian dysmenorrhœa will, after the description given above, be as follows. In cases where increase of ovarian congestion appears indicated, in order to promote ovulation, we shall have recourse to warm sitz baths, warm fomentations and vaginal injections, if possible. In addition, hot foot-baths, dry or wet cupping to the loins, perhaps also occasionally leeches to the inner surface of the thighs will all be useful. In all these cases care must also be taken that the bowels are thoroughly emptied both before and during menstruation, and we may in addition use the clysters with extract of aloes recommended by Schönlein. In making these attempts, however, to increase local congestion, we must be very careful not to forget that this is just the form of dysmenorrhœa which is so prone to cause pelveo-peritonitis, and should symptoms of this affection occur they must be treated according to circumstances by hydropathic measures, or quite cold fomentations, the administration of ice, opiates, and so forth. Opium or chloral in clysters are the best remedies for soothing the pain. If attacks of this kind have once occurred, we must never be induced, when the menstrual period comes round again, to have recourse to stimulant remedies or to the so-called emmenagogues.

In those forms of chlorosis which appear amenable to therapeutical treatment, we may have recourse to the usual measures. The diet and manner of living should be carefully regulated; when possible the cold water cure may be had recourse to, with due precautions, or we may advise sea bathing, or a residence near the sea, or in an elevated spot. I have seen more good results from such means as those than from a methodical course of iron.

If we now turn to the second principal class of dysmenorrhœa which assumes a prominent place after the development of puberty and includes those cases in which the cause of the pain is in the uterus itself,—cases of uterine dysmenorrhœa or of painful menstruation in the strict sense of the words,—we shall find that there are two particular factors to be attended to. In

the first place a large proportion of these cases of dysmenorrhœa are due to anteversion and anteflexion of the uterus, conditions which, as is well known, are often congenital, the uterus having more or less definitely retained its original position and infantile form from the time of its embryonic development. It would lead us too far from our subject to enter more minutely into these congenital anteversions of the uterus so frequently met with, and I will only remark that the symptoms are essentially different according as defective development of the genital apparatus is, or is not associated with the changes of position so frequently occurring. In the first case all symptoms of dysmenorrhœa are often absent, as we have already previously noticed, and such cases come under the cognizance of the physician only because the individuals after marriage are found to be sterile, or because some inflammatory affections have supervened. The symptoms are different when the uterus is tightly and firmly fixed to the posterior walls of the bladder, its development, like that of the ovaries, being normal; in such cases there is nothing more common than violent dysmenorrhœa. While in the first class of cases, it not seldom happens that as a consequence of the menstrual congestion or of the regular performance of coitus after marriage, the uterus, as it appears, gradually becomes developed, and its position becomes restored, these signs of amelioration very seldom occur in the latter group, and in these cases the troubles often considerably increase as time goes on. These are, moreover, just those cases of anteflexion, in which I have seen great benefit result from the use of an intra-uterine stem, when this appliance can be worn.

Finally, as a consequence of defective development of the uterus, or at any rate, of a part of this organ, we must mention that form of dysmenorrhœa, which in recent times has been more and more recognised as the essential type of diseases due to a mechanical cause—I refer to that form of dysmenorrhœa which is never absent where there is stenosis of the canal of the cervix. This stenosis is nothing but a defect in the original formation of this canal. In cases of this kind we find, in the first place, that the uterus is of normal size (the hypertrophies, as we shall see, are often a consequence), the vaginal portion sometimes, but by no means always, small and delicate, the external orifice is quite abnormally small, being often only a

small depression of the size of a pin's-head, which often takes some time to find. In the most marked cases, it is very difficult to introduce even a piece of fine wire, and this contracted condition always extends to the whole of the canal of the cervix, so that as far as the internal orifice, there is the same difficulty and resistance to be encountered in introducing a fine probe. The diagnosis therefore of the condition in question is readily made, the naked eye is able to recognise it, probing, that is, the attempt to do so renders the diagnosis certain. Congenital stenoses of the internal orifice, which always forms the narrowest portion of the canal of the cervix, may occasionally occur, but I have never been able positively to convince myself of their existence, and a perfectly exact diagnosis thereof is, I am sure, very difficult, if not impossible. The stenoses of the internal orifice occurring in retroflexion and anteflexion of the uterus are the simplest and most easily made out, and they cause the mechanical dysmenorrhœa which exists under these circumstances; this, however, belongs to the symptoms of displacements of the uterus.

In the diagnosis of congenital narrowing of the cervical canal, my experience teaches me, as I have before said, that a sufficient distinction has not been made with regard to those cases in which this stenosis is only one of the symptoms of general defective development of the uterus, and is present as a matter of course, and can be designated neither as a peculiar pathological appearance, nor regarded as an object for treatment. We shall see that this circumstance has given rise to much misunderstanding in the views with regard to the significance of limited stenoses of the cervical canal.

When the functions of the uterus and ovaries are normally discharged, the symptoms caused by the stenosis of the cervical canal are always of the same character. Before any visible discharge of blood (menstruation) occurs, the patients suffer from pain, which gradually increases until it becomes intense, usually radiating from the loins, and having a close resemblance to the pains of uterine contraction. When this pain has reached its acme, discharge of blood takes place, and with this there is often complete relief of all the symptoms. It not very seldom happens that these painful sensations are several times experienced during one menstruation, attacks as described again and again

recur, and are followed by a greater or less increase in the quantity of blood discharged. In other cases the symptoms begin with the escape of a small quantity of blood without much pain, then suddenly violent uterine colic sets in, and when this is at its height a quantity of coagulated blood is usually expelled. With these symptoms other attacks of the most diverse kinds, such as vomiting, etc., are often associated, but these may be regarded simply as consensual phenomena. The essential nature of the whole of this dysmenorrhœal process is easily explained by the stenosis of the canal of the cervix. If, as above described, we must assume that, in menstruation, the blood drains away just as it escapes from the surface of the uterine wall, any obstacle to its passage will favour, and will be certainly followed by, its accumulation in the cavity of the uterus. An accumulation of this kind, however, will expand the uterus, that is, will force the uterine walls apart, these having been previously in apposition, for the *cavity* of the uterus, in the ordinary condition of the organ, exists *in posse*, rather than *in esse*. The uterine walls will thus be strained and stretched, and contractions will follow to expel the accumulated blood. These contractions will of course be the more intense, that is, the pains will be the more violent, the narrower the canal of exit and the greater the resistance. If the mass of blood has become coagulated the resistance will be considerably increased. Scarcely any objections can be raised against this theory as to the nature of the mechanical dysmenorrhœas, those at least that have been made are based upon utterly incorrect premises. It has been urged that fluid blood escapes drop by drop out of a much narrower glass tube, particularly when it has accumulated to a certain extent above the tube, but this objection is of no significance as applied to the case before us, for the canal of the cervix is in no sense a tube with stiff walls, and the slightest accumulation of blood in the uterine cavity is sufficient to cause the symptoms which have been described. It is more surprising that in the typical cases of stenosis of the canal of the cervix we sometimes meet with accounts to the effect that the first appearance of menstruation was unattended by any particularly violent pain, but that month after month the attacks became worse and worse. The cause of this, however, is easily to be found in the conditions to which the cervical stenosis gives rise. When the menstrual process

begins, only a small quantity of blood is excreted, and this may easily escape through the narrow canal without exciting violent symptoms, but as soon as the mucous membrane becomes in the least degree more swollen than it was before, a few drops of blood may remain behind; this excites the mucous membrane of the uterus and its cervix, and readily induces more swelling; the congenital obstruction becomes much increased, and violent contractions are required to overcome it—the case becomes one of pronounced dysmenorrhœa. In these cases the assertion that the increased swelling of the mucous membrane is the cause of the dysmenorrhœa would only be an idle contention, the swelling is indeed only the consequence of the stenosis, and the serious effects which it produces are only due to the simultaneous existence of this latter condition. Besides this, the influence here indicated, which the stenosis exerts upon the mucous membrane of the cervix and uterus is of far greater consequence. Serious alterations of the uterus, the results of these monthly attacks of colic, cannot fail to occur, and are found in all cases on close examination.

In the first place, catarrhal swelling and hyperæmia of the mucous membrane will very soon set in, and show itself, even in the absence of menstruation, as cervical catarrh; the more this swelling increases, the greater, as a matter of course, will be the impediment to menstruation, and the more violent the uterine contractions for the expulsion of the menstrual blood. This explains the fact, demonstrable in so many cases, that the dysmenorrhœa always goes on increasing, especially if by marriage the patients are exposed to additional causes of excitement and congestion. The repeated contractions of the uterus very soon induce hypertrophy of its walls, and the accumulation of secretion, both blood and mucus, distends the cavity, and thus a condition is produced which I have designated as hypertrophy with dilatation, or excentric hypertrophy, of the uterus, analogous to similar changes in the heart. These anatomical changes sufficiently explain two facts; the first is that the symptoms of mechanical dysmenorrhœa come on gradually and then always increase, and the second, that after a certain time has elapsed, if the changes have existed for some time, no striking effect will be produced by removal of the impediment, inasmuch as the consecutive changes that have taken place in

the uterus now amount to an independent affection, and never again subside. I will, in passing, just remark that sterility is always present in these cases of stenosis, and, according to my experience, it is only in extremely rare cases that simple dilatation of the canal of the cervix is sufficient to cure this condition, the consequences above described having a great deal to do with the subsequent course of events. Speaking generally, I scarcely know a more typical form of disease than that of mechanical dysmenorrhœa. It frequently happens that individuals suffering from this affection determine to seek the advice of a physician only when, after marriage, the ever increasing troubles become unbearable, and their sterility makes them anxious. In all these cases, the account given is, that the dysmenorrhœa existed before the marriage, and that it has gradually become worse and worse since its commencement. After what has been above described, all this is easily intelligible. In cases of stenosis of the external orifice and narrowing of the canal of the cervix without dysmenorrhœa, I have always been able to demonstrate defective development of the uterus generally, and these are just the cases which are often enough brought forward to show that stenosis of the cervical canal may exist without dysmenorrhœa. It is impossible to understand how anything can be adduced from cases such as these against the correctness of the views just defended, for the two conditions are entirely different.

There is at the present day no doubt whatever that dilatation of the cervical canal is the only means of remedying the above described form of dysmenorrhœa, and there are sufficiently abundant cases to prove that by this method of treatment the patients are often at once relieved of all their sufferings. The method by incision is the only one which ensures a tolerably complete dilatation, all other methods involving the use of absorbent substances are only transient in their effects. It is, however, certainly sometimes necessary to make use of absorbent tents in order to dilate the canal so that cutting instruments may be introduced. Whichever method of making the incisions may be adopted appears to me, generally speaking, to be a matter of no consequence, but those double knives ought unconditionally to be rejected, which make the freest incisions in the parts adjoining the internal orifice, and very limited ones in the external orifice of the uterus (Simpson's Hysterotome).

There is the less reason for my entering into a discussion of special methods, and details of the important after treatment, as these subjects have been completely, as well as admirably, handled by Olshausen in this collection of clinical essays. It is easy, according to my experience, to avoid the undoubted dangers attendant upon incisions of the cervical canal, by cutting the internal uterine orifice as little as possible, or indeed not at all, and by conducting the after treatment with the greatest care, above all things enjoining on the patient absolute rest in bed for some days. The division of the internal orifice of the uterus is, as I have repeatedly convinced myself, certainly not always necessary for the success of the operation, for the limited stenosis of this part occasions but a very small amount of obstruction as compared with the stenosis of the entire canal of the cervix.

We cannot deny that after any of the various methods of dividing the cervical canal, it is often difficult to prevent the parts from again becoming closed—in this respect, all the methods which have been adopted resemble each other. For some years I have always made use of Greenhalgh's Metrotome, and I consider it to be the most convenient and best instrument for this purpose. The cutting edge of this instrument is excessively sharp, and the incisions made by it are very prone to heal, but I find that this drawback may always be obviated by dividing the uterine orifice not only from side to side but by making a crucial incision. To do this I re-insert the instrument and cut in the direction of the antero-posterior diameter of the pelvis; the wound thus caused has but little tendency to unite. In this respect, however, it is important to attend to the after treatment, which consists in the insertion into the canal of the cervix, of tents soaked in liquor ferri, and these must be persevered with for a long time. If the patients are seen again some time after the operation has been performed, the much diminished size of the previously wide gaping orifice will usually cause some surprise; but I have never met with a case in which the cervical canal has become as narrow as before the operation, or in which dysmenorrhœa has recurred. It is only in rare cases that I have not observed the most striking improvement or even complete relief of all the menstrual troubles to result from this operation. In a small number of unsuccessful cases, the fault was in

the performance of the operation; just as the incision is made the patients sometimes give a sudden start, so that the metrotome slips out of the cervical canal and makes but a very small incision. The external orifice may be thus sufficiently widened as to allow the operator to think that it is dilated to the requisite extent, and unless this error is immediately perceived, there will, as a matter of course, be no good result when the next menstruation takes place. If, however, this failure is once brought to notice, its occurrence will immediately be recognised on attempting after the incision to insert the pledget into the cervical canal, and under those circumstances the little operation should be immediately repeated.

There is yet a larger series of unsuccessful cases, the reason for this being that they were unsuitable for the operation. My early experience certainly was to this effect. These are those cases of defective formation of the entire uterus which have been already described, and in these, if the ovaries are also in a similar condition there is usually an absence of dysmenorrhœa, but it sometimes happens that the ovaries are normally developed. These, then, are cases of ovarian dysmenorrhœa, in which, as a matter of course, no good result can possibly follow the division of the imperfectly developed cervical canal. Mistakes of this kind can only be prevented by careful investigation of the size of the uterus.

It is true that in some few cases the consequences of the stenosis, which have been described, the hypertrophy of the uterus, become so considerable that menstruation will still be troublesome even after division of the cervical canal, but these troubles will usually be less violent than before and will often gradually subside.

If I now, in conclusion, allude only briefly to that disorder of menstruation which has the greatest claim to be regarded as an independent affection—I refer to dysmenorrhœa membranacea—the reason for this is that I have nothing new to offer from my own experience. Many of the cases classed under this head are those in which abortion has taken place, but no kind of doubt can be entertained that the expulsion of the decidua menstrualis *in toto*, or as large shreds, may occur as a morbid process at each menstrual period in cases where the idea of conception or even of cohabitation must be excluded. After what has

been explained with reference to the nature of menstruation, the dissolution of the decidua, it is certainly intelligible that continuous layers of the decidua menstrualis should be expelled as membranous shreds when this breaking up occurs in consequence of hæmorrhage into the deeper layers of the mucous membrane (Solowieff) or other disorder, and not in the usual way. We can at any rate easily understand that according to the depth at which the separation of the mucous membrane *in toto* ensues, it will happen that sometimes there is an absence of glands in the extruded membrane (R. Maier and Hegar), sometimes these are all present (Hausmann); and sometimes they are only to be found in separate portions. (Saviotti observed the cæcal extremities of the glands to be wanting.) In like manner, the observation that in one menstrual period the decidua may be twice expelled as a membranous sac corresponding to the form of the uterus, as I myself have seen, finds a ready explanation in the fact that at first the superficial layers of the decidua, and then afterwards the deeper layers, are detached as a connected membrane. This has also been described by Solowieff.

With regard to the therapeutics of this affection, I have hitherto adopted the usual course, and applied various caustics to the uterine mucous membrane after previous dilatation of the internal orifice, but I cannot say that any permanent good effect has been produced.