



MENSTRUATION

AND THE

Periodicity.

LAW OF MONTHLY PERIODICITY.

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From December No. Richmond and Louisville Medical Journal, 1875.



The occurrence of a sanguineous flow from the genital organs of women at the period of puberty, and its recurrence there after at intervals of a lunar month for thirty years, unless interrupted by pregnancy, lactation or disease constitutes a phenomenon sufficiently strange to excite wonder and to stimulate inquiring minds to its investigation. Accordingly, from the days of Hippocrates to the present time, attempt after attempt has been made to solve the problems of its causation and periodicity. To the modern physician such questions are not simply matters of laudable scientific curiosity, but have a direct bearing upon the pathology, diagnosis, and treatment of female diseases. Thus far, physiologists have not been able to answer them in a definite manner, and, baffled in their search for facts, have contented themselves with the fabrication of theories. These have varied in character from the grossest superstitions to the most subtile refinements of scientific ingenuity; but in this connection it is unnecessary to enumerate even the most plausible, for

there is only one that is now regarded with any thing like general favor. This is the *ovular theory*, which assumes that menstruation is due to the periodic discharge of ovules from the Graafian follicles. Intimately associated in its origin with the discovery of an important physiological law,* and ably advocated by high authorities, it has come to be received by the Profession at large as demonstrated and established; and for the last twenty years has exercised a decided influence in modifying our views on practice. But to my mind it is unsatisfactory, and I will proceed in as brief a manner as possible to assign the reasons.

It is necessary, however, in the outset, to obtain a distinct enunciation of the theory in question, that we may understand the extent and nature of its claims; and instead of expressing this in my own words, it is certainly fairer to accept it as set forth by some of its most intelligent advocates. In looking over the various authorities for explicit statements of this kind, I find the language of many so ambiguous that it is impossible to determine exactly what opinions they hold. But there are some who entertain definite ideas and are capable of expressing them accurately. By these, the ovular theory is presented to us under two phases, the one simply maintains that the regularity of menstruation is dependent on the regularity of ovulation; the other goes a step further, and prescribes a cause for the periodicity of ovulation. The first is the form in which it is adopted by Cazeaux, as these extracts from his "Treatise on Midwifery" will serve to show.

"After having read all that has been written on the subject, the mind rests entirely satisfied in its ability to refer this singular phenomenon to one unchangeable and easily verified fact; namely, the successive evolution of Graafian vesicles." (Second Am. edition, p. 91)

"Menstruation is, therefore, intimately connected with the evolution

* The law of spontaneous ovulation.

of the ovarian vesicles, and can not occur without it; and every time that it appears, we may feel satisfied as to the existence of a vesicular development." (Page 92.)

"Why is it that ovulation in the human species recurs about every month? To this question science is unable to reply, for it is probably one of the impenetrable mysteries of nature." (Page 93.)

Of the second phase, our own countryman, Dr. Meigs, is probably the most lucid expounder. His views are fully elaborated in his *System of Midwifery*; but the following passages, the one from his work entitled *Woman and Her Diseases*, and the other from a note to his translation of *Columbat on Diseases of Females*, are more concise.

"A healthy woman matures and deposits an ovum every twenty-eight days from the age of fifteen to that of forty-five years, failing only in pregnancy and lactation, and sometimes not even then. She sometimes suffers an arrest of the force during lactation, yet in the majority even that arrest is of short duration; and in many it does not take place at all. The closing stage of maturing and depositing or discharging the ovum is attended with a discharge of bloody fluid from the genitalia, which is called menstruation, because it takes place once a month. That bloody fluid exudes from vessels on the inner aspect of the womb, which has become engorged in common and along with the ovary, and which, by this discharge, is relieved of its hyperæmia."

"The question as to why it (ovulation) should have so exact a periodical character, is no more difficult of solution than that of the stated periods of eruption of the first and second dentition, the growth or fall of the hair on the head," ect.

All this seems very plain and easy to be understood, and I admit would be so if there was only one ovary. There are two of these bodies, however, equally concerned in the elaboration of ovules; but numerous observations have shown that, as a rule, only one Graafian vesicle is ruptured at a menstrual period. The question then very naturally arises, How do the ovaries divide the work between them? What is their rhythm of action? One of the two things must be the case, they must alternate month by month, first one and

then the other maturing an ovule, or each must remain in functional activity for two or more consecutive months while the energies of the other are in abeyance. Mr. Girdwood seems to have entertained the former idea, as he claimed to have met with cases in which women have menstruated a certain number of times, and after death a corresponding number of cicatrices were found upon the ovaries, equally distributed between the two. In either event the removal of one ovary should affect the periodicity of menstruation. If the first supposition were correct, it would take place thereafter bi-monthly; if the second, it would be rendered irregular. But nothing of this kind ever happens. Innumerable instances are on record, in which, after the extirpation of one ovary, menstruation has continued in the ordinary manner.

Here, then, we encounter a serious obstacle to our acceptance of this theory at the very first step. I am fully aware that its friends might attempt to bridge over the difficulty by a simple and ingenious hypothesis. They might say that when one ovary is removed the other takes on compensatory action and does double duty, just as when one kidney is removed the other assumes its functions and excretes as much urine as was previously excreted by both.

To the disciples of Dr. Meigs, I would reply that this is an impossibility, for the time of ripening and rupture of each Graafian vesicle is preordained from the birth of the individual, as much so as the "periods of eruption of the first and second dentition," ect. To the other faction I would answer somewhat more at length. In the first place I would deny the justness of the analogy, for the ovary is not a gland in the ordinary acceptation of the term* it neither secretes nor excretes. The rudimentary ovules exist in the embryo, and the ovaries merely afford a favorable

nidus within which they are matured. Suppose the analogy were insisted upon, is it not reasonable to believe that some degree of additional development would be necessary in the remaining ovary to enable it to accomplish its task. This development would require time for its completion, and in the meanwhile we would expect menstruation to be somewhat irregular, whereas experience tells us that single ovariectomy does not interfere with the menstrual function any more than other grave surgical operations. In many cases there is not a single interruption.

It has been justly urged against this theory, that it is not fully sustained by the results of post-mortem examinations. If menstruation is secondary to and dependent upon ovulation, then in *every* instance in which a woman dies during or soon after a menstrual period, we should be able to find evidences of the recent rupture of a Graafian follicle. But several observers* have encountered cases in which no such evidences could be detected. In evasion of this objection, it is claimed that the vesicle may proceed in its development up to the final stage, when without rupturing, it excites the menstrual congestion, and then aborts or undergoes a process of atrophy.† As Tilt has said, this is a virtual abandonment of the whole theory. At best it is a mere assumption, for what other proof could we possibly have of the maturation of a vesicle except its rupture?

On the other hand, ovulation may be accomplished without causing menstruation, as it is shown by the frequency of conception in nursing women, when menstruation is suspended, and in young women who have never menstruated. Furthermore, it is quite certain

* Coste, Ritchie, Ashwell, Paget, Bischoff, Williams and others.

† Caseaux, p. 91.

that ovulation takes place in some persons more frequently than menstruation; that is, it happens not only at menstrual periods, but during the interregnum. This would be inferred from the possibility of impregnation at this time, and has been ascertained to be a fact by actual observation.*

The most conclusive of all testimony against the ovular theory of menstruation has been furnished by the results of recent operations of double ovariectomy. We now know that a woman, after this operation, may menstruate for years; in fact up to the ordinary climacteric age in a perfectly natural manner, "as to time, quality and quantity."

In order to determine as accurately as possible the effects of the removal of both ovaries upon the menstrual function, I have carefully examined and arranged in the accompanying table all the cases of which I could obtain reports. In every instance in which no mention is made of subsequent menstruation, I have taken it for granted that it did not occur, and irregular sanguineous discharges I have, of course, not counted as menstrual.

Of the twenty seven cases here recorded, it will be observed that in nearly half, menstruation was not affected by the removal of the ovaries; in one the hæmorrhagic discharge was increased (3); in one it was diminished (7); and in several sanguineous flows occurred at irregular intervals (24 and 27).

[Since the original publication of this article, I have obtained reports of nine additional cases; three by Thomas, three by Batty, one by Trenholme, one by Kimball and one by Bryant. In three of them the subsequent history was not given, the reports having been made immediately after the operation; in two menstruation was arrested; in one it recurred three times at the usual intervals and then ceased, and in three, among which was a case of vicarious menstruation, it was not affected.]

*Ritchie, *Lon. Med. Gaz.*, 1844. p. 138, case 4.

TABLE OF CASES IN WHICH BOTH OVARIES HAVE BEEN SUCCESSFULLY REMOVED FROM WOMEN UNDER FORTY-FIVE YEARS OF AGE.

No.	Operator.	Quoted from	D'te	Age	
1	Pott.....	.....	178-	23	
2	J. L. Atlee.....	A. J. Med. Sci., 1844.....	1843	29	
3	Bird.....	Lancet, 1848.....	1847	32	Menstruation uninterrupted; tendency to menorrhagia.
4	Peaslee.....	Lyman's Table.....	1850	24	
5	Burnham.....	Lyman's Table.....	1853	42	
6	W. L. Atlee.....	Atlee on Ov. Tumors.....	1854	35	Menstruation regular. Ceased in 1864, 45th year.
7	W. L. Atlee.....	Atlee on Ov. Tumors.....	1855	19	Regular molimen with white discharge.
8	W. L. Atlee.....	Atlee on Ov. Tumors.....	1861	40	Menstruation regular to 1863, when last reported.
9	Peaslee.....	A. J. Med. Sci., 1863.....	1862	35	
10	Peaslee.....	A. J. Med. Sci., 1864.....	1863	39	
11	W. L. Atlee.....	Atlee on Ov. Tumors.....	1864	34	Last report 1870. Menstruation regular to that time.
12	Beattley.....	Wells, Dis. of Ovaries...	1865	37	
13	Storer.....	A. J. Med. Sci., 1868.....	1866	.....	Menstruating regularly a year after operation.
14	Storer.....	Peaslee on Ov. Tumors...	1867	43	
15	Wells.....	Wells, Dis. of Ovaries...	1868	39	
16	Wells.....	Wells, Dis. of Ovaries...	1869	22	
17	Hicks.....	Wells, Dis. of Ovaries...	1869	39	
18	Munro.....	Wells, Dis. of Ovaries...	1870	34	
19	Mayer.....	Wells, Dis. of Ovaries...	1871	29	Last report one year after operation. Menstruation regular.
20	Meadows.....	Lancet, 1872.....	1871	.....	Last report six months after operation. Menstruation regular.
21	Priestly.....	Wells, Dis. of Ovaries...	1872	22	
22	R. A. Jackson.....	Peaslee, Ov. Tumors.....	1865	44	*Continued to menstruate to the 47th year of her age. Menstruation regular.
23	Le Fort.....	Peaslee, Ov. Tumors...	.....	.....	Menstruates, but not regularly.
24	Baker Brown.....	Peaslee, Ov. Tumors.....	.....	.....	Menstruates regularly from cicatrix and vagina.
25	Baker Brown.....	Peaslee, Ov. Tumors.....	.....	.....	Menstruation regular.
26	Koeberle.....	Peaslee, Ov. Tumors.....	.....	.....
27	Batley.....	Personal Information.....	1872	23	Irregular sanguineous discharges sometimes profuse.

Clay, of Manchester, had four cases in which there was subsequent sanguineous discharge.—(Peaslee.)

* Her regular monthly period had ceased the day before the operation. A flow per vaginam recurred thirty days afterward, and continued four days, with the usual symptoms of lassitude, nervousness, and backache. It again appeared after an interval of eighty-three days; and after this time it recurred with perfect regularity every twenty-eight or twenty-nine days for twenty-two months accompanied by all the ordinary symptoms of menstruation, and lasting each time from three to five days; it then ceased for four months to reappear for the last time; the patient being now forty-seven years of age. During all the time, the patient's health was excellent, and Dr. Jackson satisfied himself that there was no disease of the uterus or vagina.

† The whole uterus, except cervix, removed with ovaries.

The only explanation that can be offered by those who still adhere to the ovular theory of this persistence of menstruation, is that it is due to the force of habit. Yet in case No. 22 the function was suspended for three months at one time, which we would suppose should have been sufficient to have broken up the habit. But such an explanation is unscientific, as well as unsatisfactory; in fact it is no explanation at all. Habit may be defined to be a faculty or a proneness for the performance of any act in consequence of its frequent repetition, and may for our present purpose be divided into two classes, entitled respectively habits of aptitude and habits of recurrence. A habit of aptitude is simply a faculty acquired by practice, as when we say, "this man sleeps soundly in spite of the noise, because he has acquired the habit of doing so." Our so called habit of menstruation belongs to the second class. The most familiar example of this is the habit of "regularity of the bowels." It is well known that if a person will persistingly solicit a movement of the bowels daily at a fixed hour, in the course of time he will experience an inclination to go to stool regularly at that hour. This is said to be the result of force of habit. Let us investigate the subject, and see if we can not arrive at a more accurate understanding of it. The enforced regularity engenders a healthy state of the bowels, promotes its secretions and peristaltic action, and restores its nervous sensibilities to a normal condition; the rectum being each day subjected to about the same distension before it is evacuated, acquires a tolerance for the presence of a certain amount of fæcal matter, and after awhile whenever this quantity has accumulated, an impression is made upon the nerves of the part and transmitted to the sensorium. It might still be said that it is the nerves which have

acquired a habit of responding to a given degree of irritation. True, but this is a habit of aptitude, not a habit of recurrence; no one would pretend to say that a sensation would be experienced if there were no fæcal matter in the rectum. Here then, is a habit analyzed and rationally explained; and all habits of recurrence may be treated in a similar way and attributed to some antecedent cause or causes. This fact has long been recognized in mental philosophy, some writers considering all habits in which a mental process is concerned as the result of an association of ideas.* Thus, we perceive, the word habit is used either as a short way of expressing a complex series of acts, or as a cloak to cover our ignorance in obscure cases. There must be a cause for menstruation after the removal of the ovaries. Is it not probable (yes, I may say certain,) that it is the same cause which existed previously? The ovaries being wanting, there are no vesicles to rupture. The logical conclusion is, that the periodicity of menstruation never did depend upon the discharge of ovules.

This conclusion can not be disputed if our premises are admitted. We have proceeded upon the hypothesis that the Graafian vesicles exist only in the structure of the ovaries, and that the ablation of the latter would necessarily involve their removal from the economy but this point deserves some consideration. Spencer Wells remarks:† “The ovaries are usually two in number; not necessarily so, for their essential elements may be dispersed between the layers of the peritoneum, as in the lower animals. Ovisacs or Graafian vesicles have been seen developing in some of the mammalia at a distance from the entire ovary.” In another place he speaks of the development of vesicles thus situated

* Dugald Stewart.

† Diseases of the Ovaries, p. 11.

into unilocular tumors. Savage says nothing on the subject himself, but gives the following obscure quotation from Sappey;* "It is not a rare circumstance to find on the alar mesentery, especially 'round about the ovary, ten, fifteen, twenty, or more even, cystic ovules, some of them the size of a pea. Such ovules having failed to reach their destination, owing to some abnormal relations on the part of the Fallopian tube.

I have looked through all the writings at my disposal, and conferred with several anatomists and physiologists, to obtain definite information on this subject, but without success; and my own limited investigations on the cadaver have resulted negatively. No observations would be of value unless accompanied by a microscopic examination, in order to determine by the detection of the ovules whether small cysts found in this locality were truly Graafian follicles. In the ordinary operation of ovariectomy, a considerable portion of the broad ligament contiguous to the ovary constituting the pedicle, is excised. In Baker Brown's case (No. 25), the whole uterus, except the cervix, was removed with the ovaries. Storer reported a case in the "American Journal of the Medical Sciences," 1868, in a woman forty-seven years of age (consequently not included in the table), from whom he removed the uterus and both ovaries. Yet on the eighteenth day after the operation and the twenty-sixth day after the last appearance of the catamenia, "there occurred a sanguineous effusion, attended by feelings of backache lassitude, ect., lasting thirty hours, and being an evident attempt at the reestablishment of menstruation".

I think it a very fair conclusion, that if such vesicles really existed, they were totally extirpated in some, if not in the greater part, of the thirteen cases in which

* Savage on the Female Pelvic Organs.

menstruation continued after the removal of both ovaries. Even if some of them remained, it is clearly impossible that they could have been sufficiently numerous to have afforded a ripened vesicle every month for ten or more years. Their only effect would have been to stimulate the nervous system and maintain in a more perfect degree of its ovarian development.

The foregoing objections are only a tythe of those that may be offered to the ovular theory of menstruation, but they are enough to compel me to reject it. It must not be inferred, however, that I deny all influence to the ovaries in determining the menstrual function. Observation has conclusively demonstrated that the presence of mature Graafian follicles within the organism of the individual is absolutely necessary for its primary establishment; for, in every instance in which the ovaries have been congenitally absent, or artificially removed before the period of puberty, menstruation has failed to take place. The ripening of the germ cells exerts an influence upon the female economy generically similar to but specifically different from that which the ripening of the sperm cells has upon the economy of the male. The evolution of spermatozoa by the testes reacts in some mysterious manner upon the nervous system and determines characteristic changes in distant portions of the body, especially the development of the larynx and the growth of hair upon the face. So in the female the maturation of ova creates an erethism of the nervous system that results in structural changes throughout the entire organism, the minute ramifications of which we can not trace, but its grosser manifestations are seen in the expansion of the pelvis, the enlargement of the breasts, and the increase of the adipose tissue. The power to develop hair upon the face may be considered an inherent

power of the economy, since rudimentary hair bulbs preexist in that locality; and the same may be said with reference to the power to develop the larynx, the pelvis, the breasts, and the adipose tissue; the state of the generative centres simply calling these powers into play. Sometimes in consequence of disordered states of the generative organs, this synergy of the nervous system is perverted from its usual channels, and other innate powers are aroused. A marked case of this kind is reported in the "London Medical Gazette" for 1843-4, in which suppression of menstruation, due to an acute affection of the ovaries arising from exposure to cold, was followed by a growth of hair over the whole surface of the body. Is it not a legitimate inference that *the Law of Monthly Periodicity which dominates the menstrual function is also inherent in the animal economy, and is simply stimulated into activity by the ovular erethism?*

When once the physical modifications referred to have been induced at the period of puberty, the subsequent removal of the testes or ovaria does not necessarily cause them to recede. Sometimes there is a tendency to a return to a neutral type, as was evinced in Pott's celebrated case, where after the removal of both ovaries, the voice became coarser, the form more angular, ect. On the other hand, after many of the operations of double ovariectomy, no loss of womanly attributes has been noticed; and almost every surgeon is familiar with cases of castration of men where the voice and personal appearance have remained unchanged. If, then, the manifestation of the Law of Periodicity has an origin in common with the physical alterations—that is, depends on the same condition or development of the nervous system—we would expect

that it would exhibit an equal tendency to permanency after the withdrawal of the primary exciting cause. In this way alone can we account for the persistence of menstruation after the removal of the ovaries.

To what extent does this law prevail? Is it an essential, all pervading principal of life, under ordinary circumstances accomplishing its work without external signs? Or is it a dormant energy of the system, which is only exerted in order to accomplish a specific purpose? If it were the first, we would expect to see it occasionally displayed in the male subject. It is true, instances of this kind have been reported, but all of them will be found, upon investigation, to be open to charges of error. In the "American Journal of the Medical Sciences" for 1853, there is an account of a being who, in all external appearances, seemed to be a man, in whom menstruation occurred regularly from the urethra. After death, an examination revealed the fact that the creature was an hermaphrodite. In the same journal for 1867, there is another case, in which a young man is said to have experienced a monthly sanguineous flow from the glans penis. Such cases, even admitting their authenticity, are incomplete without a post-mortem examination to demonstrate the absence of the ovaries. There is still another class of cases in which the symptoms are too vague and shadowy to deserve notice. In short, there is a total absence of positive proof that periodic phenomena of a monthly type are ever present in the human male.

The statement of naturalists with reference to periodicity among the lower animals is very unsatisfactory. This is due, in part, to the fact that most of them being converts to the ovular theory, have regarded menstruation and œstruation as analogous.

According to Saint-Hilaire, menstruation occurs in several species of monkey every month and is exactly similar to the process in the human female. Dr. John Percy, of Birmingham (quoted by Girwood), says he has had constant opportunities of observing the female mandrill and drill during four years. "At intervals of *about six or eight weeks*, the labia become uncommonly distended, red, and shining. The swelling proceeds gradually and attains its maximum in about five days or a week. It then gradually declines and a quantity of sanguineous discharge makes its appearance, generally, though, so far as I have observed, not uniformly." Dr. Girwood maintained that each genus of the mammalia has its own catamenial cycle, and endeavored to determine them chiefly by a microscopic examination of the vaginal discharges. To a rabbit, he assigned ten days; to the mare, a fortnight; to the cow, three weeks; to the dog, twelve to sixteen days, and so on. All that can be deduced from such testimony is, that if there are periodic phenomena among the lower animals, they are confined to the female sex, and are, as a general rule, of a different type from those observed in the human species. I would, therefore, conclude that the Law of Monthly Periodicity is not an essential element of organic life, and is inoperative, except in the human female, and possibly in the females of some of the higher mammalia, where it subserves a special purpose in connection with the process of reproduction.

Let us next inquire somewhat more closely into the nature of this law. "Laws of animal nature," says Webster, are "the inherent principles by which the functions of animal bodies are performed." These principles are not always primary in their character,

but are, as a rule, resultants of antecedent acts which take place with sufficient precision to establish the principle or law for the government of the consequent function. The Law of Monthly Periodicity is that which governs and determines the periodic return of menstruation and its attendant phenomena, and must necessarily be the result and exponent of certain changes or series of changes that transpire within the organism in recurring cycles; these cycles being uniform in their duration, definite in their manifestations, and common to woman-kind. The essence or factor of the Law, then, is a dynamic cycle of physiological acts. But in what part of the system does this cycle revolve? Where is the seat of these changes?

Not in the ovaries, as Tilt supposed, for their annihilation does not always arrest the action of the law.

Nor in the uterus, for women in whom this organ has been congenitally absent, have experienced unmistakable signs of monthly periodicity.

Paracelsus, DeGraff and others located the process in the blood, Nature has negated this class of theories by presenting us with the Hungarian Sisters, in whom the bloodvessels were united at the loins, thus giving them a common circulation, but their menstrual periods were different.

Tyler Smith has advanced an ingenious hypothesis according to which the monthly cycle is attributed to reciprocal action between the uterus, ovaries, and mammæ. But, as we have seen, two of these supposed agents may be withdrawn with impunity.

An affirmative answer to this question is just as easy and may be just as absolute as those in the negative. There is not the slightest doubt that the functional process by which the monthly cycle is accomplished

is seated in the ganglionic nervous system. The expansion of the pelvis, the growth of the breasts, and the increase of adipose tissue which take place when the young girl arrives at the age of puberty, depend upon a modification in the nutrition of the parts, and that nutrition throughout the body, is presided over by the ganglionic nerves, no one of the present day will deny. In order to achieve such important variations from the previous course of nutrition, the nervous tissue itself must undergo structural development, which, as we have already said, like all other structural alterations, has a tendency to be permanent. In the course of this development, the elements of the Law of Periodicity are elaborated and the series of changes constituting the monthly cycle are instituted. The operation of the Law, being usually declared through the circulation (by means of hæmorrhages) which, like nutrition, is controlled by the ganglionic system.

[While this reprint has been going to press I have met with the report of a case of double ovariectomy by Verneuil and Terrier, in the *American Medical BiWeekly* for Jan. 19, 1878, which is of interest in connection with the attempt to explain the continuance of menstruation after the removal of both ovaries, by force of habit. The following is an extract therefrom.

"The operation took place on July 6, 1875. No uterine hæmorrhage took place till the following December. On December 25th menstruation appeared, was very profuse for four days, and lasted in all six days. Menses did not recur till February 20, but were then so abundant as to compel the patient to keep in bed, lasting for ten days.
* * * Until the summer of 1876, menstruation only occurred each alternate month; from that time it became regular with an interval of from four to five days over a month, lasting regularly from six to eight days, and accompanied by neuralgic pain in the left breast and arm." ANNALES DE GYNÆCOLOGY.]