



Menstruation and its
relation to nerves of uterus.

James Hudson, 777 B.
65 Brighton Grove.
Newcastle-on-Tyne

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The subject of menstruation has had new light thrown upon it by the recent marvellous advance in operative Gynaecology, and as a subject in which I have taken an interest, the bearing of these observations have been most interesting to me. I have also a series of cases of vicarious menstruation from which as pathological variations, conclusions may be drawn. Menstruation, as a function, is one in which the slightest variation, either in excess of discharge or from increase in backache, to the most violent pains, is such as makes any deviation from the normal observed at once. In no other function of the body are the signs and symptoms more generally noted by women, and any variation gives rise to much anxiety or pleasing hopes. A woman may suffer all the pains of Dyspepsia, neuralgia, all the discomforts of torpid bowels, and say and think nothing about them, but any trifling alteration in

the menstrual discharge is at once noted and medical advice sought. For that reason it is a function, which medical practitioners have constantly brought before them, and in its endless phases, the more one considers the matter, the more interest and perplexity it has. The following then dwells on some points which I hope to illustrate with some observations from cases met with in practice, not claiming however to attempt a full account of menstruation and the nerves of the uterus.

The late Prof Leishman writes that without saying ovulation and menstruation are cause and effect, yet they have a strong bearing on each other, and that we are entitled to assume that the periodic discharge depends on corresponding changes in the ovaries associated with the maturation of a Graafian follicle.

Yet there are many cases recorded where both ovaries have been removed, and

a menstrual discharge recur at the usual periods, as among others, Dr Japp Sinclair in Brit Med Jour. Vol 1 1893 P. 1106. writes 'when if both tubes and ovaries are removed and require prolonged drainage so leaving a sinus. Not in all cases but in many such cases at the time corresponding to the menstrual period, there is a discharge of blood from the sinus; this discharge lasts a day or two or more and then disappears, to recur once more at the time corresponding to the menstrual period.'

Also in many instances where even the uterus has been removed along with ovaries there has been all the general symptoms of a menstrual state without an external discharge. Seeing that the rupture and extrusion of an ovum is generally said to be the starting point in the phenomena of Menstruation, including all the symptoms not directly connected with the generative system, it is difficult to see how, when the ovaries have

been completely removed there should be any symptoms of menstruation remain, especially those of the general system. This point, the importance of which is manifest, shows that some other cause must be looked for in the causation of menstruation than the ovaries. No doubt when the ovaries are removed there is ultimately an effect upon menstruation always, but too many cases have been reported for testing, and finding wanting the theory that it is caused by an excitation from a Graafian follicle.

There is also the direct evidence gained by observation in cases of abdominal section by Lawson Tait and Leopold that the Graafian follicles mature and rupture at any time.

What purpose does menstruation fulfil? To my mind there is no doubt that it is as Pflüger says, a preparatory process in which the epithelial cells of the uterus, which have grown old are swept away, and a new

surface exposed, bathed in lymph so as to attach the ovum with its albuminous covering on its descent into the uterus. It is a process in which the uterine surface is freshened so that a surface rich in blood and with actively growing young cells is exposed.

Reichert's theory, supported by Engelmann and Williams, that menstruation is a sign of the non-occurrence of pregnancy being the removal of what he calls the *Decidua Menstrualis*, a membrane which is prepared during the inter-menstrual period for the reception of the ovum. Also that pregnancy is not to be calculated from the last period, but from some time between the last menstruation and the one which does not occur. This is completely refuted by taking into account the lower animals. If the Rut is the same as menstruation, and as it only occurs at long periods in the lower animals during which time there is no desire for intercourse,

which desire is intimately connected with the heat; if there is a process like menstruation in, say dogs, followed by desire for sexual intercourse during which fecundation often occurs, that points that there is a preparatory process, not as he says a destructive process in menstruation.

Let me say something showing how clearly there is a process like menstruation in the lower animals, a fact very clear to my mind. 'In Carnivora, the mare, the cow there is a slightly bloody discharge from the external genitals; while apes in their wild state have a well marked menstrual discharge'. (Landois & Starbuck) The first part of the above quotation does not help one very much, while the latter part suggests the idea that the use of the upright position may have a tendency to produce a more copious discharge as in apes and the human species.

I had an opportunity of observing the process in a young bitch, and for three days the

external genitals were swollen, everted and drops of blood issuing forth from the vulvar orifice. The blood was of the same uncoagulable nature as is seen in women. The amount was by no means large but sufficient to fall in drops on the ground. During this time the bitch was not in heat, refusing all approaches of the male kind. At the end of three days there was a considerable reduction in the amount of external swelling so that the parts were nearly normal, and it was then, and then only that there was desire for sexual intercourse. I observed the same sequence of events repeatedly, and on making enquiries at competent authorities found the above, corroborated, that for about three days there exists external swelling and often discharge, but no desire for intercourse.

There has been much discussion about the analogy of the rut in animals and menstruation in women, and the absence of any discharge,

has had great weight thrown upon it as showing there is no real listners. In the case above mentioned there was a distinct discharge, and during that period an inappetence for sexual congress in which the swelling and congestion of the parts showed would have been of a painful character, which would certainly have been at variance with nature's plan. Looking at the phenomena as a whole it is difficult to see how a process like menstruation should not have its analogue in the lower animals, and that menstruation should be a distinguishing point of the preeminence of the human species.

The amount of blood discharged is of slight account, as that varies much in women, but the fact that there is some blood and that there is a process of congestion, and during that time a sexual inappetence is to my mind of the strongest evidence of a process of menstruation, or of a series of phenomena having in view

the preparation of the uterus for the reception of the ovum or ova.

How is menstruation monthly?

Drummond in his 'Ascent of Man' has thrown out the idea that it has been evolved in the man race from a time when it was perhaps yearly. As the race became more highly developed, their intelligence commanded a larger and more continuous supply of good food, which in turn developed more highly the sexual passion, probably in man first, and it reacting on females, the rut became more frequent, and from periods perhaps yearly at first, it became monthly.

As showing that menstruation is not intimately connected with ovulation, I may mention the fact that it falls during pregnancy. In abortion its influence has long been recognised, as in how many cases does one find in making enquiries, that abortion occurs just at the time menstruation would have set in. I think I am not saying too much when I put it at 90%. Also in

many cases one finds when no mis-carriage occurs, that there has been signs of excited uterine action characterized as pains or even as a slight discharge of blood. These discharges are common at the third missed period, and owe their harmlessness to the fact that the two decidua are not yet united.

In Placenta Praevia we also see menstruation assert itself as it is most generally at the times when it should have occurred that haemorrhage takes place.

During pregnancy, as I will show, haemorrhage may take place from a distant organ, and in its association with uterine symptoms, show it is of a vicarious nature.

Mrs G, aet 25 yrs, whose family history is good; both parents being alive. She has had three children, all of whom are living. Had an abortion at the 3rd month a year ago, otherwise has always been normal in generative system. I saw her on Mar 18th 1893, and found her,

suffering from pains in lower part abdomen and other signs impending abortion. She changed last in Christmas week, so was in 12th week. I found that on Mar 16th, two days before I saw her, she had vomited about half a cupful of blood, and later on in the day her nose had bled. The same night pains came on, and continued on and off till the 18th when I saw her, and when an abortion occurred. There was no haemorrhage before the fetus came away, but in the decidua was a part much darker than the surrounding tissue, which had manifestly been caused by an extravasation of blood into it some time previous.

Also another case of a similar nature.

M^{rs} A., aet 40 yrs is a strong woman of the lean sinewy type, who has had a large family, eleven, the youngest aged 2 1/2 yrs. She has had two abortions, first between 2nd and 3rd children, and again between 6th and 7th. Otherwise

always healthy in generative system, menstruation
always regular; when present coming on at the
18th day. I was called, Nov 8th 92, for reason
of a vomiting of blood. She had felt no pain,
and beyond a slight nausea before vomiting, said
she was quite well. I saw the blood which
was dark in colour, and could only have lain a
short time in the stomach. The quantity was
not large, about a breakfast cupful; no signs
of collapse were present. On examining the
abdomen no pain on palpation was complained
of and the liver was normal. It was only
by strongly enforcing the risk she ran, that the
woman consented to remain in bed. The
vomiting occurred at 9 a.m. and I was sent
for again at 8 p.m. and when I arrived
found a child born. Pains had commenced about
6 p.m. I separated the cord, and on removing
the placenta found a clot of dark blood lying
loose in the centre of it. The quantity would
be between 3 and 4 oz. She had changed last

in the first week of April, so was in the 32nd week, and appearances bore out that statement. I most diligently sought in both cases for any source, organic or otherwise, (hysteria is often associated with haematemesis, Charcot) and if one had only to rely on the haematemesis and epistaxis no deduction could be drawn; but when one sees those haemorrhages associated with a uterine bleeding occurring at the time when menstruation would have occurred, one is forced to the conclusion of the intimate connection between those series of phenomena.

All these are evidences that menstruation does not stand in such a close relation to ovulation as is said; for I consider that ovulation ceases during gestation, even though superfœtation in turn has been attempted to be explained by the descent of another ovum. There is also the evidence that no corpus Luteum, besides that of pregnancy, has been found in the ovaries of females who have died during gestation or after labour.

So that it is plain to me, if there are no ova discharged during pregnancy, and as we have reason to believe menstruation still asserts itself during that time, that we can only consider the two processes as separate.

Conversely if menstruation occurs without ovulation, so does ovulation without the external signs of menstruation. That conception has taken place without any menstrual discharge many instances well authenticated have been recorded, the fact being generally admitted. However I do not see anything improbable in it as in the dog a process analogous to menstruation occurs with very little discharge of blood, and no doubt in many animals it is infinitesimal. In those cases in women the ovum may develop in utero without any preparatory process, but it is more probable that a freshening takes place without however any distinct haemorrhagic discharge. In females nursing it is not rare occurrence to find them becoming pregnant

without any discharge having been seen. Here we see, when lactation is going on, it is as much as nature can do to keep one process going, so that again we have not so much activity displayed in menstruation as in the usual course, but there is doubtless a freshening here.

During menstruation there is a general dilatation of arterioles throughout the body, which may be divided into local and general. General, as evidenced by headache, worse on stooping, fulness of pulse, tendency to palpitation to keep up the increased blood supply, and general malaise. Also an increased supply of blood to the mammary glands causing an increase in bulk, a sensation of fulness with a general excitation of the glandular elements giving a corded feel to the hand. Locally in the pelvis a congested condition of all the organs giving rise to a sensation of heaviness, pain in back and other signs.

I think now we are in a position to

state that we regard menstruation as being under
 the special control of vaso-dilator nerves. In the
 action of these nerves we may see how they may
 lay such an important influence over the
 uterus. There is a general centre in the medulla,
 and they are disposed throughout the spinal
 cord in a far more extensive area than the
 vaso-constrictor nerves. They come from the cord
 especially through the sacral nerves, and form
 junctions with the sympathetic system, so that even
 with the cord destroyed their function may be
 carried on. They differ from vaso-motor nerves in
 that they are medullated to their extremities. Their
 influence over the uterus and pelvic organs is
 exerted through the nervi Erogeni. In Stirling &
 Candour we see about those nerves in the male, 'if
 the nervi erogeni be divided there is no effect upon the
 erections of the penis, but if their peripheral ends be
 stimulated, the sinuses of the corpora cavernosa
 dilate, become filled with blood and erection takes
 place; and in respect to the uterus, 'there are also vaso-
 dilator

(17)

dilator fibres through the nervi erigentes to the uterus.' In the *thorda Tympani* we have fibres of the same nature, while if the peripheral end is irritated there ensues dilatation of the vessels of the submaxillary gland, and the veins pulsate like arteries. The influence of these nerves may be seen in disease, as in a case I met with, where my attention was drawn to the excessive salivation by finding a calculus on the duct for the gland. There was a history of excessive salivation for over twenty years, so much so that the patient was in the habit of taking a towel to bed with her and finding it saturated in the morning. It commenced after the age of 10 yrs when she had *Scarlatina*, after which both her ears became affected with chronic catarrh with purulent discharge. She is deaf, more especially on the same side as the calculus was found. In this case the inflammatory condition of the middle ear had acted as a chronic irritant to the *thorda Tympani*, as it

passes through it, and caused a permanent dilatation of the vessels in the submaxillary gland and so an excessive salivation.

From a case of this kind it is easily seen how any irritant to any branch of the nervi erigentes may cause such a lesion as Menorrhagia, or more intense, Metrohagia.

In organic disease of the uterus or peri-uterine tissues, one of the first symptoms is usually profuse menstruation set up by an irritant to those nerves causing a prolonged dilatation of vessels and so haemorrhage in excess.

Local diseases act as irritants to the nerves bringing about haemorrhage in a reflex manner, also besides bleeding it may occasion organic changes in the uterus by lowering its vitality, as Pogyi says: 'reflex congestions of the uterus leading to a predisposition to infection, that endometritic lesions supervene in cases of diseases of the appendages.'

Those vaso-dilator nerves doubtless have

spinal centre, but whether it is situated in the lumbar region or higher up in the medulla, it is difficult to say. The uterine functions seldom suffer in diseases of the Spinal Cord, though in Hereditary Ataxy, which often occurs about the age of 20, menstruation usually becomes irregular and then ceases. (Gower Vol. i P. 464)

Gower also says that menstruation goes on independently of cord disease, (exception above) and may be regular although there is absolute arrest of all conduction, sensory or motor.

However, Lanclos & Stirling says that when the cord is completely destroyed at a certain level, the vaso-motor centres below quickly recover and exert their influence over the blood-vessels. The ramifications of the vaso-motor and vaso-dilator nerves with the sympathetic system outside the Spinal canal probably explains their independence of the conducting fibres of the cord.

Such a hypothesis, namely that a centre for

menstruation exists in the spinal cord more easily explains the varying nature of that function; as how is ovulation to explain all these phenomena? There may be no occasion to cite particular instances, but take such a common one as frequent menstruation. Can it be explained by saying that an ovum is more often discharged; as in that case, the ovary, the more the general health of the woman declines, the more active it becomes. By looking at menstruation as having a centre in the cord we have for amenorrhoea and menorrhagia an analogy in the reproductive organs of the male. In spermatorrhoea we have a weak state of health in which the reflex centres in the cord are under less control than in normal health, and which leads first to an increased secretion of seminal fluid and an undue excitability of the reflex centre for ejaculation. Following which, or independent of it, we have a failure of

reproductive power. To the excessive secretion and incomplete control, we may put against it menorrhagia, and to the loss of seminal discharge that of amenorrhoea. We do not mean to imply there is any analogy of function, but an analogy of processes controlled from a spinal centre, which is well known in the male.

In Vicarious menstruation we have symptoms showing if the centre for menstruation is not capable of working, how the general centre for the vaso-dilator nerves in the medulla may be influenced sufficiently to lead to local haemorrhage in some part of the body.

Haemorrhages by the older writers were often ascribed to vicarious origin when the evidence was certainly weak; but is there not now too little account taken of menstruation in many cases of haemorrhage? Is it not too much the habit nowadays to ascribe every thing to a local cause, leaving out of account

The general functions of the body? Before the function is established it is difficult to characterise & bleeding as vicarious as we have nothing to act as a guide; however if a woman has all the signs of womanhood, and no menstruation and her general condition such as one would expect that it should occur and if in this condition a haemorrhage from lungs, stomach, bowels or skin should occur, and if it should recur with an approach to periodicity, I think one is justified in considering such a haemorrhage, vicarious, provided there are no signs of organic mischief.

Agnes K. act 19 years, school teacher.

Family history good. Father and mother living.

She is the youngest of four, all living.

Personal. Has had no serious illness from childhood and was in good health till the worries of teaching commenced to tell on her. Menstruation commenced at 15 yrs, and continued regular up to three months ago when it stopped. She complained since stoppage of weakness and nervous symptoms as headache,

irritability. She is not anaemic to any extent as her lips and mucous membranes are well coloured.

I was summoned one night and found she had had a coughing of blood to the extent of perhaps three ounces. There were a few râles in large bronchi but no dulness. Cough had not troubled her before this, though for some days she had not been at school for reason of headache. For two days her sputum was tinged with blood; her temperature keeping normal. Four weeks later there was another haemorrhage with the same signs as the first. She had complained each month since menstruation stopped of symptoms of an impending discharge, headache, pain in back etc. She was put on Cod Liver Oil for two months with no recurrence of symptoms and then on Bloods pills, and within a month she became again regular, having seen nothing for seven months.

In Prof M. C. Anderson's Treatise on Skin Diseases he gives an instance of a vicarious eruption on the skin which exuded blood, and which appeared

at regular intervals. There is no use giving other examples as all I want to show is how if the menstrual centre is not working, how the vaso-dilator nerves, through a general centre may become excited so as to give rise to haemorrhages in different organs.

The Causation of Labour is I think intimately connected with this spinal centre for menstruation. The following instance shows their relationship: I was attending Mrs W. who was pregnant, when she mentioned that she had been very ill with pains for some hours, so that she thought labour was coming on. I put it down as a period and made the calculation labour would be due in four weeks. However it did not come off, so I thought I had been mistaken. Labour finally set in on June 18th and on looking up my notes found I had calculated four weeks too early, and that my supposition was quite correct; as below.

Dates. April 24th when pains felt.
 May 22nd when expected
 June 18th when child was born.

ject the theory in this way; we have a centre in the cord for menstruation, which is under the control of the general vaso-dilator centre in the medulla.

Other nerves influencing the uterine arteries passing by way of the nervi erigentes. During pregnancy there is a large excess of blood going to the uterus for purposes of nutrition. The menstrual centre at the periods has not much effect on this increasing organ and its contents, unless there is some weakness of its connections, decidua etc as is seen in abortions, or unless the centre is unduly stimulated as may be seen in those cases of recurrent miscarriages. During pregnancy the uterine fibres are immature; the fibres many but not perfect as is seen by the uncertain action of Ergot on the increasing organ. At the end of pregnancy the muscular fibres are in a physiological mature state, a condition of excitability, ready to respond to the stimulus of any sudden excess of nutritive fluid, so when the time of the tenth period comes round, the stimulus is applied and Labour commences.

This influence may be exerted upon the mature fibres through the motor nerves in the uterus, reacting on the centre for parturition in the medulla.

Brown Sequard's theory, deduced from the effect of apnoea on pregnant animals, produces a pathological condition, and one which appears to act on all unstriped muscle, as is seen in the intumescences produced in the dying, in the contractions of bladder and bowels in fits and other instances.

Dr Tyler Smith has suggested that the cause is to be found in the ovaries, remarking on the intimate connection with the menstrual period. I am all in agreement with him leaving out however that the ovary has anything to do with the matter at all.

Spiegelberg supposes that the maternal blood contains some essential to the immature foetus, and when the foetus is full grown it has no want for it, and then it acts on the centre for parturition inducing labour. Putting it in his own

nds: 'it is the maturity of the foetus which gives the signal for contraction, and this can only be explained by some substances gradually accumulating in the maternal blood as maturity approaches and arrives; which substances had till then been used up by the foetus, but are so less and less till at a certain point the foetus can no longer make use of them since it now requires other substances for its further development.' This very ingenious theory does not however explain how abortions and mis-carriages come about, nor the well recognised fact that those occur at the monthly periods, so that I consider the view here put forward explains how labour comes on, and the pathological variations better.

Another aspect is; why does not menstruation come on after labour? The influence here that inhibits the centre is that of lactation. During a period the vessels going to the mammary gland become dilated, the secretory centre participating in the excitement of the.

menstrual. During pregnancy there is a gradual increase in the glandular substance of the mammary glands, and a special fullness when the menstrual period would otherwise have occurred. After parturition the secretory apparatus becomes active, and as long as it is at the height of functional activity the menstrual function gives no sign. There are exceptions to this, but in all cases the function of the mammary gland is not at its highest point. In the good facts, I think I am correct in saying, that the two functions do not exist together at their highest physiological standard. Each menstrual period with its chance of fertilization prepares the ground setting off a stimulating process which if conception takes place is continued. When the mammary secretion is required for the growth of the offspring, all the nutriment which would otherwise be wasted in the function of menstruation, is diverted to the mammary glands.

The vomiting of pregnancy has always an interest because of its frequency, and associated with that, its mystery. In the late Prof Leishman's treatise he, I think, underestimated the frequency with which one may meet severe cases, when he says a practitioner may only see such a case once in a lifetime. I have seen two cases where induction of abortion did not stay a fatal result; another case where debilitation of os had a beneficial effect, and one where the question of abortion was considered, but it was decided to wait, happily with a good result. What strikes one in those cases is the failure of drugs, especially drugs having a topical influence on the stomach, so that no doubt remains that it is more than a local gastric congestion. The view that it is sympathetic or more correctly a reflex nervous phenomenon has the best support, and I would explain it by reference to the theory of a menstrual centre. During the first four months the uterus and foetus increase

very little in weight in comparison to the rapid increase afterwards, and for these first months the menstrual centre must be held in check very severely, for there is no loss of blood and no great amount going between periods to keep down its excitability, which therefore becomes stored up. In close connection with the centres for the control of bloodvessels in medulla is that of the centre for vomiting, which carries out its function through the vagus. The excitability of the menstrual centre is reflected through the vaso-dilator centre to that of vomiting, and the treatment of vomiting is that arising from a cerebral cause as in sea sickness, as rest in the dorsal position, morphia, stimulants, and members of that class of remedies which one may designate as tonics to the menstrual centre, as *Diburnum*, *Alctris*. How the vomiting stops, as it undoubtedly does, usually sometime between the 16th and 20th week, one has to look at the following table from *Speigelberg*,

when one sees how the sudden increase in weight of uterus and foetus must mean an increased flow of blood to that organ, and a corresponding decrease in the pent up condition of excitability of the menstrual centre, and through it a fall in the irritability of the centre for vomiting.

	Of. Foetus = Length.	Weight.
End of 3 rd month	= 3.75 - 4.25 inches.	460 grs
End of 4 th " "	= 4 - 6.75 " "	850 grs
End of 5 th " "	= 7 - 10.5 " "	4080 grs

so that from the 16th to 20th week, the foetus increases in weight equal to more 4 1/2 times its weight at the end of the 16th week.

In reference to the treatment of vomiting by dilating the os cervix, if we look at the nervous supply of the uterus I think we will learn the cause. By the 2nd and 3rd Sacral nerves some fibres issue to form the nervi erigentes, and they enter the hypogastric plexus, whence they are sent downwards to the generative organs.

Also to the hypogastric are sent fibres from the last dorsal, the upper three or four lumbar nerves which unite with the sympathetic.

From the hypogastric plexus they pass down, and form a large ganglion called the cervical ganglion situated behind the cervix from which nerves radiate upwards on the walls of the uterus. The dilatation of the os cervix must have a powerful effect on this adjacent ganglion, and the stretching will act as a stimulant to the nervi erigentes, and through their influence cause more blood to flow to the uterus, and in that way relieve the irritated centres in the cord.

Let me draw attention to another uterine disorder viz Fibroids, where I think an instance of perverted nerve action, localised to one part or many parts of that organ, may be traced.

A Fibroid is simply a piece of uterine tissue which has taken on new growth, and while it is true there are other tumours accumulating to the

structure in which they grow as neuroglia, this is preeminently the case in Fibroids. In the enlargements of the ends of bones in Chronic Rheumatic Arthritis, we have an analogy, and in this there is some doubt whether we have not to deal with an affection of a spinal centre. In cases of Fibroma there is a general enlargement of the uterine walls seen by the increased depth of the cavity, and so constant is this hypertrophy, even in connection with a very small interstitial tumour as to be called Fibroid pregnancy. (Poygi: P. 276-7.)

The fact of Fibroids becoming cystic, carcinomatous, sarcomatous does not invalidate the assumption, as all these are added lesions. Another point to be considered is the presence of nerves, (Poygi 281) showing it is simply a hypertrophy of existing tissue. Their behaviour during pregnancy when they participate in the increased nutrition, and when after pregnancy ^{they} take part in the involution of the uterus as also at the menopause, shows their close affinity to normal uterine tissue.

In Fibroids there may be other general symptoms of perverted nervous function showing their close connection to perverted action of the menstrual centre, as in the following extract from Epitome of Brit. Med. Jour. 'A history of four patients who had Fibroids, and were further troubled with palpitation, determination of blood to the head, dyspnoea and pains in the chest. In two cases these symptoms disappeared when the fibroids were removed, in the other two, disappeared when they ceased to grow.'

In the electro-therapeutics of these tumours we see simply the effect of the current on the dilator nerves causing them to contract their bloodvessels and so reduce the blood supply. Necessarily the results are uncertain, as it would depend on the position of the tumours and upon the accessibility of the nerves, but there is no doubt it is not simply by cauterising that the curative affect is produced. I am also of opinion that

in the nervous supply of the uterus is to be found the clue to the cessation of growth of these tumours when castration is performed, and hope that before long a less serious and mutilating operation will accomplish all the good that castration has certainly done.

All the phenomena of the climacteric range themselves round the nervous system, and especially that part relating to the control of bloodvessels, as in the heats and flushings so commonly seen. In the mental distress we see another phase of excited vaso-dilator nerves in another direction, namely upwards to the brain, leading to congestions of parts of that organ. Gastric and hepatic disturbances are common and haemorrhages may occur as in any case of suspended menstruation, as in an example I saw of haematemesis occurring thrice in a year, and the distinctive feature about these bleedings was the large quantity of blood lost. No other cause could be found, and a year afterwards the woman was

in good health.

Looking at all the phenomena of the climacteric it appears to me that giving a local cause of the cessation explains all the symptoms better. There is an atrophy of the uterus, and certainly for some years before that, a loss of fertility in women; the age at which child bearing generally ceases in women who have had large families being about 42 years. This cessation of function is I think due to a lessened capability of the uterus to recover itself after each menstruation, and to a lessened proliferation of cells possessing vitality to nourish an ovum. The mucous membrane becomes more resistant and the vessels smaller, so that there is not that disintegration of cells which occur normally. The toughened mucous membrane resists a period during which there are all the general signs of menstruation, and perhaps a second, but when it comes there is a much larger loss of blood than usual, as the m. m. in its

atrophy has lost its elasticity by which it normally controls any excessive bleeding. This goes on till the m. m. can resist any tendency to haemorrhage, and shortly afterwards the centre from disuse becomes inactive and the nerves atrophy.

In the establishment of menstruation we see the signs often of a vain attempt of the spinal centre to become working, not however any signs of a centre which is being repressed. At puberty it is as though a feeble stream was making ineffectual attempts to establish a passage; at the climacteric as though a full stream was being forcibly dammed back, often breaking loose, and setting up all the signs of a repressed function.

The various new and important additions to the therapeutics of uterine diseases act by means of the nerve supply of those organs, and by accepting the fact that a large number of diseases arise through the faulty action of the nerves, and by applying such remedies as we

have, a decided advance has been made in uterine therapeutics. In the examination of the properties of Ergot, it is found that ergotinic and sclerotinic acids possess vaso-dilator properties, and that sphacelinic acid and cornutin cause contraction of uterine tissue. In those diverse properties, the rationale is seen how to employ Ergot, and how it has been lauded in such different conditions. Ergot has the reputation of bringing on menstruation in cases where anaemia is not marked, and here is seen the action of the ergotinic and sclerotinic acids on the vaso-dilator nerves through a spinal centre. In its haemastatic power it depends upon its action on the muscular tissue of the uterus, and we can well understand its affect on a well developed uterus, and its uncertainty on the normal organ. For the muscular affect cornutin or sphacelinic acid is responsible, the former has been separated and found useful in

haemorrhages.

In *Hydrastis Canadensis* we have another drug acting apparently solely upon the nerves of the uterus. It influences the vessels by means of a sedative action on the vaso-dilators, and is therefore a most valuable remedy in the haemorrhages of the pregnant state where no action is derived on the muscular tissue. I have found it useful in menorrhagia where we may suppose the vaso-dilators are stimulated.

In *Diburnum Prunifolia* and *Aletris* we have drugs showing a tonic action on the menstrual centre. A case to illustrate their influence; a girl at 18 yrs had ceased menstruating for six months, and after some months' treatment with Bland's Pills with no success, I gave her *Aletris cordial*. In 14 days she changed and remained regular. A woman, who had had four abortions at the 3rd and 4th months, was put

upon Viburnum at the second month of her fifth pregnancy. She continued it till the fifth month and a child was born at full term.

Another case was a woman who had haemorrhage at the third month which was checked by rest in bed. At the fourth month some more bleeding occurred which was controlled by rest, and Viburnum was given, after which she went on well.

The action of the Aletris was to stimulate a menstrual centre, which only required some such stimulus to make it resume its usual function. The Viburnum, in those cases of abortions where it has been found of service, acts as a tonic to the menstrual centre, giving it power to exercise more control over the nerves and so checking haemorrhage, which in turn produces an abortion.

Generalisations.

That ovulation and menstruation do not stand to each other as cause and effect.

That the rut in animals has a stage, which is analogous to menstruation in the human race, for the purpose of preparing the uterus for the reception of the ovum or ova.

That menstruation is a function possessing a centre probably in upper part spinal cord under a general centre in medulla, which may excite the vaso-dilator nerves throughout the body as is evidenced by vicarious menstruation in virgins, also in the pregnant and at the menopause.

That menstruation is an active force during pregnancy as is seen in Placentæ Praevia, abortions, haemorrhages and pains at the usual time of the absent period.

That menstruation, with its centre and nerves, is the initial cause of labour. Enquiries as to the usual duration of the inter menstrual time which may be longer or shorter than 28 days; and

counting that labour commences on the tenth period, a valuable aid is obtained to the prognosis of when labour is due.

That the vomiting of pregnancy is due to an irritable state of the centre for vomiting, reflected from the menstrual centre, and measures directed to that end will probably prove of value. Also that dilatation of cervix acts on the nerves from the menstrual centre, the nervi erigentes, and that less risky measures as a continuous current of electricity might be beneficial.

That the nervous supply of uterus is the cause of a number of lesions, which require study, as in Fibroids; and other lesions, for which castration is performed, would be as well treated by means directed towards the nerves, such as electricity, or as by stretching or severance of these nerves.

That we act on the menstrual centre by means of drugs, another example of the application of the empirical method which has forestasted the discovery of the true physiological action.

In this thesis I have tried to show some cause why menstruation should be connected with a system of nerves, and I have based my reasoning on some cases that I have seen, and that have lead me to that conclusion.

I hope however I have not given way to the temptation as Latham says 'to press known facts a little further than they will bear when that little is all that is wanted to establish a theory.' On such a wide subject one has to restrict oniself to a special part, and that part is the influence of the *Nervi Erogeni*. The other nerves are many and each has a function but it would be too large a subject, if I were able to enter into it, but one where good results to practical medicine and surgery would follow from their study.