occasion, let the opportunity go by for advancing uterine pathology, as though it were of no moment; and I must not, consequently, blame others, but rather try to improve myself, and ask my friends to move with me. As yet, the literature of medicine has not produced more than sixty-six contributions on fœtal diseases, and the majority of these are only stray, and often imperfectly reported cases. How important, then, that all cases of fœtal disease should be from henceforth recorded, that some central mind may group such diseases together in their respective classes, and elaborate a true and philosophical system of uterine pathology.

P.S.—It may be worthy of remark that the lady, Mrs. L., who in September, 1856, gave birth to the fœtus, the subject of the foregoing remarks, was yesterday (September 27th) delivered of a healthy and well formed female child at the full period. T. H. B.

Bedford, September 28th, 1857

THE PHYSIOLOGY, PATHOLOGY, AND THERAPEUTICS OF THE MOTOR FUNCTIONS OF THE UTERUS.

By H. Hannotte Vernon, M.D., Physician to the Great Northern Hospital; formerly Resident-Accoucheur to St. Mary's Hospital.

[*Continued from page* 642.]

Part II.—Pathology (*concluded*).

The next nervous centre which arrests attention is—

3. *The Spinal Cord.* The general effect of the exaggerated importance which has, I believe, been attached to the spinal cord, as far as the physiology of labour is concerned, has been to exalt also its pathological importance. There are doubtless many and very grave circumstances which arise out of morbid states of the spinal medulla, whether these consist of conditions existing in the tissues of the cord, or from states of the economy at large. But what appears to me necessary in relation to the influence of the spinal cord on morbid labour is, to divest the professional mind of the idea that all or nearly all aberrations of excito-motor action of the uterus are aberrations of spinal innervation. The anatomical fact of the extremely scanty supply of spinal nerves to the uterus itself, is evidence enough that the *primary* derangements of uterine nervi motor action must spring from another source. What that source is I have been at some pains to show. The general physiological law as to the readiness of conduction or diffusion of impressions from one nervous centre to another, being in direct proportion to their intensity, is, moreover, another light by which to read the pathological importance of the spinal cord. The additional fact that organs in the immediate vicinity of the uterus, or in close sympathy with it, are (with the exception of the ovaries) well supplied with spinal nerves, points out that whatever influence the cord exerts upon labour must depend chiefly upon two things; first, upon excitations of other organs than the uterus, of considerable intensity; or, secondly, upon very marked morbid conditions of the spinal cord itself. The locality of eccentric excitations has been discussed before, and attention must now therefore be confined to conditions of the medulla itself. The period of labour at which morbid states of the spinal cord produce their effect upon the parturient act is when dilatation of the os uteri has been accomplished, or nearly so, and when the presenting part of the fœtus has begun to impinge upon and excite those organs and muscles which are supplied with spinal nerves. The exceptions as to the period at which the state of the cord begins to influence labour, arise out of the intensity of the morbid states; for it may be easily seen that extreme polarity of the centre in question will be diffused and conducted to the ganglia of the uterus proper, and thus modify the peristaltic or primary movements of labour from the very beginning. Morbid states of a minor degree do not declare themselves until the nerves of the cord itself are implicated, or until the voluntary and concomitant consensual movements of labour should exhibit themselves.

It is only necessary, in regard to the spinal cord, to resolve its various morbid modes of action into two conditions, which underlie them all; viz., (*a*) hyperæsthesia, and (*b*) hypæsthesia. These two ideas are simple enough, and under them I believe we can range all aberrations of nerve action in relation to uterine motor action. Protean as are the secondary causes of spasm on the one hand, or inertia on the other, they all, with the exception of structural changes in the uterus itself, end in exalted and diminished polarity of nervous centres, topical, or general, or induced by eccentric irritations.

a. Hyperæsthesia of the cord results in the first place from conditions of other parts of the nervous system. Emotions and energetic cerebration would appear in certain instances to throw the spinal cord into a state of undue polarity. When this is the case, the most trifling eccentric irritations will suffice to set up violent reflex actions. The first pains of labour, instead of remaining dependent almost entirely upon ganglionic action, are speedily linked with spinal action. Irritations arising in the uterus itself, which, under ordinary circumstances, would not have been diffused so far, are felt by the cord; and the actions normally peculiar to a more advanced stage of labour are provoked almost at the onset. It is thus that we meet, from time to time, with cases in which, whilst the os uteri is almost closed, there are strenuous efforts, not entirely, though partly, voluntary. Such cases are not instances of mere perversity of the patient; she may close her glottis, depress her diaphragm, and call into action all the muscular power she possesses at a time when such efforts can be of little avail; but the voluntary effort is only auxiliary to a more powerful spinal impulse, which would produce a part of the effort quite independently of volition. It is curious to observe how different this confused, transposed, and misplaced action of the nervous centres is from normal action. When labour progresses under strictly physiological conditions, the first step in the process is to open the mouth of the uterus; for this purpose the uterus suffices for itself, its own muscles, impelled by its own nervous centres, are allsufficient. No imaginable action of the diaphragm and abdominal muscles can affect the opening of the os uteri until it is very far advanced in dilatation; and hence we find that normally the spinal cord and the voluntary muscles are not called into play, until it is possible for them to produce their proper effect. This is a beautiful instance of the economy of nature in producing results. As soon as volition is efficient, it is utilised, and no sooner; and so with reflex action also.

Hyperæsthetic conditions of the uterine ganglia, and of nerve-terminations in all parts of the body, sometimes the result of perverted vascular actions in the tissues in which the nerve-terminations lie, are not unfrequent causes of undue polarity of the cord. This idea I am anxious to impress upon the minds of my readers; viz., that, owing to the close intercommunication between all parts of the nervous system, persistent or intense peripherical irritations, or centric excitability of any one centre, invariably results in exalted polarity of *all* nervous centres. This is a fundamental fact, which it is necessary to bear in mind as explanatory of numerous disorders of innervation, observable not merely in the department of obstetric pathology, but in pathology at large.

The general relation of spinal polarity to polarity of other ganglia or systems of ganglia having been indicated, it is quite unnecessary to go into mere anatomical details. These are readily supplied by the most ordinary anatomical knowledge.

Another form of spinal hyperæsthesia which must be familiar to every obstetrician is that which is at once idiopathic and idiosyncratic; that is to say, peculiar to the individual, and traceable to no anterior pathological condition. It is impossible to offer any further explanation of such a condition than one which shall resolve itself into a merely hypothetical mode of expressing the fact. Why certain individuals should generate a more abundant supply of nerve-impulses than others, is wholly unaccountable. We may hypothecate a greater proportion of grey matter, or more rapid molecular changes, or twenty other imaginary conditions or modes of action; but the thing still remains really unexplained. It appears to be an ultimate fact, that persons of different temperaments possess a vitality which manifests itself in different parts of their organisation. Some affect great vegetative tendencies, and grow into human mountains upon what others would almost starve upon. Others possess a vivacity of nervous constitution, which shows itself in rapid cerebration, rapid and agile adaptive movements, and susceptibility to all kinds of impressions, whether physical or emotional. It transcends the knowledge of the physiologist to say upon what this depends; the scalpel and the microscope are useless means of investigation here, and we are reluctantly compelled to suspend inquiry just where inquiry is the most inviting.

Certain kinds of toxæmia appear to throw not only the spinal cord but all nervous centres into a high state of excitability.

The particular instance of blood-poisoning with which we are most familiar, is that which occurs in connection with the albuminuria of pregnancy. In this disease, either urea or the derivatives of urea, viz., ammonia and carbonic acid, are retained in the blood in large quantities. But the retention of such effete matters indicates other abnormal states of the blood beyond such non-elimination. The presence of ammonia and carbonic acid is cotemporary with absence of a due proportion of oxygen in the blood. Whatever organisms or elements of organisms are present must also be deteriorated in vitality. We know that an undue proportion of carbonic acid in the blood augments the volume of the red corpuscles; that ammonia imparts an unnatural fluidity to the sanguigenous or azotised elements of the blood; and that in the disease in question, there is moreover a watery and cacoplastic state of the circulating fluid, which arises partly from loss of albumen, and partly from deficient aeration. The effect upon labour of this form of toxæmia is in all cases, so far as my experience will carry me, to augment the suffering of the patient; to forestall the spinal stage of labour, and engraft it on the peristaltic or ganglionic stage before it is due. The more extreme development of the spinal polarity which declares itself in the foregoing modes of action produces the ordinary puerperal convulsions. In many instances labour is actually set up in consequence of the superinduced spinal polarity; and there is something peculiar in the incessant and clonic action of the uterus in such cases, even although pregnancy should not be advanced beyond the fifth, sixth, or seventh month. We are acquainted, then, with three separate morbid parturient actions, arising out of this form of blood poisoning; viz., premature labour, painful labour attended with anticipation of the spinal stage, and labour complicated with convulsions. Other forms of toxæmia, such as consist of the blood poisoning attendant upon the eruptive fevers, act occasionally in a similar manner. There are, besides, cases in which unwholesome diet appears to produce a toxæmia, attended with similar results; but with these we are hardly concerned, as they do not so much come within the domain of pathology as of toxicology, and are, moreover, not known in this country.

With regard to abnormal vascular states of the cord and its membranes, and the influence of such states on the polarity of the spinal cord, we have no reliable information.

b. Hypæsthesia of the cord is a condition which comes under notice much oftener than the preceding state. In crowded populations, amongst whom diet is deficient both in quantity and quality, where ventilation is bad, and all hygienics neglected, nothing is commoner than stubborn immobility of the nervous system. The usual physiological stimuli are quite inadequate to their purpose in such cases; and, indeed, there are but few resources of art energetic enough here to rouse the uterus into action. This, then, is the first form of hypæsthesia; viz., one which is the consequence of long continued mal-nutrition and debility. Exactly similar, as far as the observable phenomena are concerned, is an idiosyncratic defect of irritability of the spinal medulla, dependent, like the idiosyncratic excess of irritability, upon no discoverable anterior pathological condition.

General plethora would appear to diminish the polarity of the cord to no small extent, and by no means unfrequently. This species of spinal inadequacy is chiefly found in women who have advanced to nearly forty years of age, and have become obese.

Fatigue, which is a transient form of debility, also lowers the polarity of the spinal cord. The way in which it commonly is brought about in actual practice is as follows. Owing to the officious suggestions of ignorant acquaintances, the patient paces up and down the lying-in room incessantly for hours together, and at every pain, however early in the labour, invites violent efforts in aid, as she supposes, of the parturient act. By these injudicious exertions, exhaustion is gradually brought on; and, when the spinal stage should follow upon the peristaltic, the uterine contractions remain feeble, the voluntary efforts are nugatory, and the reflex actions are halting and inefficient. Such cases are usually met with amongst the poorer class of patients; persons in different circumstances generally have competent advice at a very early stage of labour.

Extreme emotional mobility, the effect of which is propagated, as we believe, from the great cerebral ganglia, is another condition destructive of the polarity of the spinal cord—not always, but in many cases. There is something of caprice in the operation of emotions. Joy will sometimes accelerate and sometimes suspend uterine action, and so with other affections of an emotional kind. Fear operates in both ways. But, generally speaking, *excessive* emotion has more influence than the *character* of the affective condition. States of hemispherical cerebration, in like manner, extend their operations as far as the spinal cord, and still farther. Intense thought diverts as it were the *vis vitæ* from the medulla, and deprives it of its sensibility temporarily, and to a slight extent. The absence of voluntary consent to the reflex actions of the cord is by no means without influence. I entertain but little doubt that centric actions of the cord itself depend very much upon transferred acts of the cerebrum. To such action as this I would propose the term *indirect voluntary action*. It is in this way that organs not under the immediate control of the will are made so mediately. The nature of what takes place is transformation of the conscious cerebral act into an unconscious centric spinal impulse, propagated to the sympathetic system. The cord is not in such cases the mere conductor of the hemispheres, but is a transformer of one kind of impulse into another, and a utiliser of acts which would otherwise have no final cause.

From a consideration of the foregoing particulars, we easily arrive at the conclusion that a due performance of the functions of the cord is best conserved by an equable action of all parts of the nervous system.

4. *The Great Cerebral Ganglia.* In applying the terms hyperæsthesia and hypæsthesia to the various states of the cerebral ganglia, we are getting somewhat further into the region of hypothesis than when doing the same with regard to other nervous centres. By hyperæsthesia, in the present instance, I mean great affective mobility. It can hardly be said that a very definite pathology exists as regards the emotional centres. Debility, from whatever cause, would appear to be at the root of such a condition in many cases. Congenital susceptibility must explain many others. Some must be traceable to defective education and the unrestrained impulses of a wayward nature. A few may depend upon obscure structural conditions of the centres in question, such as undoubtedly lie at the root of various forms of insanity; but their nature and extent are beyond recognition at present. Hypæsthesia, in the present instance, means nothing but stupid indifference, and is perhaps the best thing, obstetrically speaking, that can befal a woman. It is undoubtedly congenital, and, whether of the "happy go lucky" or the stolid variety of affective immobility, tends very much to unembarrassed parturition. The nearer the approach to mere animality, the easier the act of labour.

5. *The Hemispheres of the Brain.* The influence of the hemispheres of the brain proper upon labour includes all that the organs of thought can effect upon the nervous system at large. The pathology of such conditions of the hemispheres as interfere with or in any way modify the actions of the uterus, is hardly a pathology so much of a physical as of a psychical nature; that is to say, that we are not concerned here with anæmia or hyperæmia, superpolarity or subpolarity, but with actions so linked with thought, individual character, and the *will*, that we are taken almost out of the domain of ordinary pathological investigation, and landed in the less definite region of psychology. To attempt to analyse the actions of the cerebral hemispheres, to assign to them the exact share and extent of their influence upon other nervous centres, and mediately upon the uterus, would be to enter upon ground of the most uncertain and shifting kind. Speaking in the most general terms, and confining attention to the broadest possible distinctions which can be drawn between the different cerebral phenomena of labour, it appears to me that they may be reduced to two elementary sets of actions: first, the exercise of such thought as we may call conceptive, reflective, or ratiocinative; and secondly, the exercise of that primary species of thought which we call the will, and declares itself in secondary thoughts and muscular action. With regard to the first of these sets of actions, it may be said that any possible modifications of them hardly belong to pathology, unless they are declaratory of insanity. We recognise the influence of tense thought in the suspension of uterine action; but this is not brain-pathology, though such suspension belongs to the pathology of labour. In this way it is seen how health, or the normal execution of functions, is not merely an absolute idea, but consists, in reality, of a due harmony and balance between the elements of functions. Thought of the ratiocinative type is not properly included in the idea of normal parturition, though hemispherical cerebration is. The fact is, that, when the mind is employed in appreciating facts, objects, ideas, or arguments, or in carrying on a process of reasoning, it is being engaged in such a manner as to preclude the energetic action

of the will. It is in the way of volition that the brain proper is concerned in labour. Whatever draws the mind away from these voluntary exertions, which properly belong to the latter period of labour, tends to retard it. In this way, ratiocinative thought acts simply by occupying the brain when it should be busy with something else, viz., energetic volition. Hope, fear, and other emotions, when they lead to the creation of numerous ideas and the carrying on of long trains of thought of an absorbing kind, act in a similar way, viz., by excluding volition. And thus we see how emotions not only have a positive effect, and depress the polarity of various nervous centres themselves, but we see also a negative influence at work, viz., their substitution, and the substitution of their offspring, for normal processes and elements of the parturient act. It naturally follows from the foregoing, then, that it is to the will we must look alone for any direct influence of the brain over labour. Whether volition is vigorous or the reverse, interests us as obstetricians.

Energetic volition, inasmuch as it produces increased voluntary muscular action, produces more vigorous consensual action. Directed at the right time it acts harmoniously. There is doubtless, too, a stimulation of other nervous centres effected by energetic volition, and cerebral action is transformed into spinal polarity, or still further into exalted polarity of the uterine ganglia.

Defective volition may result from physical debility of a permanent kind, from fatigue, from mental feebleness, from preoccupation, or from excessive pain. The effect is diminished consensual as well as voluntary muscular action; diminished centric action of the spinal cord and other ganglia, and diminished reflex action, as the result of defective polarity, propagated from the brain.

6. *The Cerebellum.* We are only acquainted with the little brain as the co-ordinator of voluntary and automatic movements. If we exclude the irregular actions of hysterical labour, there is perhaps no way in which we have any acquaintance with a morbid action of the cerebellum in labour.

FOURTH PHYSIOLOGICAL BASIS.

An arrangement of Nervous Fibres capable of conveying the Motor Impulses generated in the Nervous Centres to an Organ endowed with power of Motion, and to other Muscles.

FOURTH PATHOLOGICAL DEVELOPMENT.

I have merely introduced this element of parturition in order to keep up the correlation of the physiological and pathological sections of this communication. Practically, there are no causes which interfere with the due conduction of motor impulses from the various nervous centres to the muscles with which they are respectively in relation.

FIFTH PHYSIOLOGICAL BASIS.

A Muscular Apparatus responding to various Impulses, either generated in or reflected from various Nervous Centres; itself possessed like all other Muscular Tissues of an Irritability of its own, and of a given Tonicity and Cohesion.

FIFTH PATHOLOGICAL DEVELOPMENT.

However complete may be the harmony of all the other elements of parturition, however exact and natural the sensibility of peripheral nerve arrangements, and however normal the polarity or other action of the nervous centres, it will tend to no satisfactory result if the muscular tissues in relation with these various nerve arrangements are not of their natural quality; that is to say, of the ordinary powers of contraction, and endowed with the cohesion and tonicity which usually pertains to muscular structures. It might at first sight seem almost superfluous to dwell upon such a deteriorated condition of the muscular structure of the uterus as must necessarily be associated with some of the aberrations of the nervous elements of labour into which we have already inquired, and which might be supposed to overshadow such a local condition, and throw its importance into the shade, as well in a theoretical as in a practical sense. But a little consideration will show that a due appreciation of the sources from whence abnormal uterine actions, whether in the way of excess or deficit, may derive, will tend very much to modify the practice of the careful obstetrician. Thus, in a case of inertia uteri dependent upon great muscular flaccidity, as well as nervous immobility, and occurring in a person who has already borne many children, it would be extremely injudicious to lash the nervous centres into excessive action and endeavour to procure delivery by the energetic action of muscles deteriorated in quality by a long period of malnutrition, or by the premature occurrence of structural involution. Such treatment would probably end in rupture of the uterus. Instrumental assistance is indicated under such circumstances. Thus, it is evident that without duly taking into account the condition of the uterine textures, serious errors in practice may be committed.

The morbid states of uterine tissue which present an impediment to due contraction, are sufficiently easy of diagnosis—in a certain manner, and are not very recondite. It is not pretended that the recognition of such morbid states in the living body is or can ever be exact and absolute. But it is comparatively easy to infer their presence with certainty enough to guide us in practice, and even with more certainty than many morbid states of other organs and tissues are daily diagnosticated and treated, as if the subjects of exact and conclusive demonstration. There is, in the first place, a congenital flaccidity of the muscles in extremely fair lymphatic persons, which extends itself not unfrequently to the uterine muscle, when it becomes developed. Such persons should always be dealt with cautiously, and looked upon as suspected of having thin and flabby uteri. Insufficient diet, bad air, all the causes, in short, which lie at the root of malnutrition, produce an atonic condition of the muscular system which declares itself in the uterus as markedly as anywhere else. Women who have borne many children are liable to a double defect as regards the uterine structure; first, to an imperfect evolution; and, secondly, to a premature involution. Upon inspection, it will be found in such cases that the nuclei of embryonic muscular fibre are abundant where the uterus has not advanced to its proper stage of development; while in instances of premature involution, there is every appearance of fatty degeneration of the muscular fibre, an anticipation in short of the natural process. It is a curious circumstance, and one which is closely connected with these facts, that cases of rupture of the uterus divide themselves distinctly into two categories, which include nearly all cases of rupture which come under observation. The first class consists of cases of obstructed labour (I do not speak after the fashion of the text-books), such as first cases, small pelves, large heads, and rigid passages: the second class consists entirely of women who have already borne a numerous family, and the rupture in such cases is sudden, quite unexpected, and occurs during the progress of a labour otherwise altogether satisfactory. Against such cases as the latter class it is to a certain extent impossible to provide; but the fact that repeated parturition does in a measure tend to deteriorate the quality of the uterine muscular fibre, should guard us against the two free use of oxytocic remedies in multiparous cases. The drain which occurs in cases of albuminuria operates in the way of damaging the uterine structures, as well as in altering the quality and consistency of the blood. The dangers which attend such cases are by no means confined to convulsions; we must be prepared for floodings, for irregular and painful contractions of the uterus, and for rupture of the organ. Were it not so frequently the case that labour sets in prematurely during the existence of the albuminuria of pregnancy, the occurrence of rupture of the uterus would doubtless be familiar to us as a concomitant of the disorder in question, but even as it is, the tendency is sufficiently obvious to induce caution as to the manner of procuring speedy delivery where it is desirable on account of actual or threatening convulsions. The presence of fibrous tumours, of cancer, especially soft cancer, and of malignant ovarian disease, tends very much to the deterioration of the structures of the uterus. The same may be said of excessive discharges of all kinds, and more particularly of repeated antecedent floodings.

I have thus sketched the pathological states which affect the due performance of the motor functions of the uterus. Without having attempted to set before the profession anything like a complete account of the subject, I hope to have at any rate presented the pathological facts in an orderly and scientific form. In all text-books with which I am acquainted, the matter is treated of in the most disorderly manner; the causes of inertia uteri are *catalogued* without reference to any of the physiological properties and actions of which they are nothing more or less than developments; and the student of obstetricy is left floundering amongst an ill assorted set of facts which, as they bear no properly expressed relation either to each other or to any analogous facts, are either retained by dint of a powerful and tenacious memory, or, what is more frequent, forgotten just when they are most required.