

without the formation of any thrombus. The foramen ovale is soon closed by its valve, which contracts adhesion with the edges of the aperture, so as effectually to occlude it. Sometimes, however, a small

FIG. 72.



Diagram of heart of infant. 1. Aorta. 2. Pulmonary artery. 3, 3. Pulmonary branches. 4. Ductus arteriosus becoming obliterated. (After DALTON.)

canal of communication between the two auricles may remain pervious for many months, or even a year or more, without, however, any admixture of blood occurring. A permanently patulous condition of this aperture, however, sometimes exists, giving rise to the disease known as cyanosis.

The umbilical arteries and veins and the ductus venosus soon also become impermeable, in consequence of concentric hypertrophy of their tissue and collapse of their walls. The closure of the former is aided by the formation of coagula in the interior. According to Robin, a longer time than is usually supposed elapses before they become completely closed, the vein remaining pervious until the twentieth or thirtieth day

after delivery, the arteries for a month or six weeks. He has also described<sup>1</sup> a remarkable contraction of the umbilical vessels within their sheaths, at the point where they leave the abdominal walls, which takes place within three or four days after birth, and seems to prevent hemorrhage taking place when the cord is detached.

**Function of the Liver.**—The liver, from its proportionately large size, apparently plays an important part in the fetal economy. It is not until about the fifth month of utero-gestation that it assumes its characteristic structure, and forms bile, previous to that time its texture being soft and undeveloped. According to Claude Bernard, after this period one of its most important offices is the formation of sugar, which is found in much larger amount in the fetus than after birth. Sugar is, however, found in the fetal structures long before the development of the liver, especially in the mucous and cutaneous tissues, and it seems probable that these, as well as the placenta itself, then fulfil the glycogenic function, afterward chiefly performed by the liver. The bile is secreted after the fifth month of pregnancy, and passes into the intestinal canal, and is subsequently collected in the gall-bladder. By some physiologists it has been supposed that the liver, during intra-uterine life, was the chief seat of depuration of the carbonic acid contained in the venous blood of the fetus. It is, however, more generally believed that this is accomplished solely in the placenta. The bile, mixed with the mucous secretion of the intestinal tract, forms the *meconium* which is contained in the intestines of the fetus, and which collects in them during the whole period of intra-uterine life. It is a thick, tenacious, greenish substance, which is voided soon after birth in considerable quantity.

**The Urine.**—Urine is certainly formed during intra-uterine life, as

<sup>1</sup> *Ibid.*, 1860.

is proved by the fact familiar to all accoucheurs, that the bladder is constantly emptied instantly after birth. It has generally been supposed that the fetus voids its urine into the cavity of the amnion, and the existence of traces of urea in the liquor amnii, as well as some cases of imperforate urethra, in which the bladder was found to be enormously distended, and some cases of congenital hydro-nephrosis associated with impervious ureters, have been supposed to corroborate this assumption. The question has been very fully studied by Joulin, who has collected together a large number of instances in which there was imperforate urethra without any undue distention of the bladder. He holds also, that the amount of urea found in the liquor amnii is far too minute to justify the conclusion that the urine of the fetus was habitually passed into it, although a small quantity may, he thinks, escape into it from time to time; and he therefore believes that the urine of the fetus is only secreted regularly and abundantly after birth, and that during intra-uterine life its retention is not likely to give rise to any functional disturbance.

**Function of the Nervous System.**—There is no doubt that the nervous system acts to a considerable extent during intra-uterine life, and some authors have even supposed that the fetus was endowed with the power of making instinctive or voluntary movements for the purpose of adapting itself to the form of the uterine cavity. Most probably, however, the movements the fetus performs are purely reflex. That it responds to a stimulus applied to the cutaneous nerves is proved by the experiments of Tyler Smith, who laid bare the amnion in pregnant rabbits, and found that the fetus moved its limbs when these were irritated through it. Pressure on the mother's abdomen, cold applications, and similar stimuli will also produce energetic fetal movements. The gray matter of the brain in the newborn child is, however, quite rudimentary in its structure, and there is no evidence of intelligent action of the nervous system until some time after birth, and *à fortiori* during pregnancy.

## CHAPTER III.

### PREGNANCY.

**Changes in the Uterus.**—As soon as conception has taken place a series of remarkable changes commence in the uterus, which progress until the termination of pregnancy, and are well worthy of careful study. They produce those marvellous modifications which effect the transformation of the small undeveloped uterus of the non-pregnant state into the large and fully developed uterus of pregnancy, and have no parallel in the whole animal economy.



A knowledge of them is essential for the proper comprehension of the phenomena of labor, and for the diagnosis of pregnancy which the practitioner is so frequently called upon to make. Excluding the varieties of abnormal pregnancy, which will be noticed in another place, we shall here limit ourselves to the consideration of the modifications of the maternal organism which result from simple and natural gestation.

The unimpregnated uterus measures two and a half inches in length and weighs about one ounce, while at the full term of pregnancy it has so immensely grown as to weigh twenty-four ounces and measure twelve inches. The growth commences as soon as the ovum reaches the uterus, and continues uninterruptedly until delivery. In the early months the uterus is contained entirely in the cavity of the pelvis, and the increase of size is only apparent on vaginal examination, and that with difficulty. Before the third month the enlargement is chiefly in

FIG. 73.



Relations of the pregnant uterus at sixth month to the surrounding parts.  
(After MARTIN.)

the lateral direction, so that the whole body of the uterus assumes more of a spherical shape than in the non-pregnant state. If an opportunity of examining the gravid uterus *post mortem* should occur at this time, it will be found to have the form of a sphere flattened somewhat posteriorly, and bulging anteriorly.

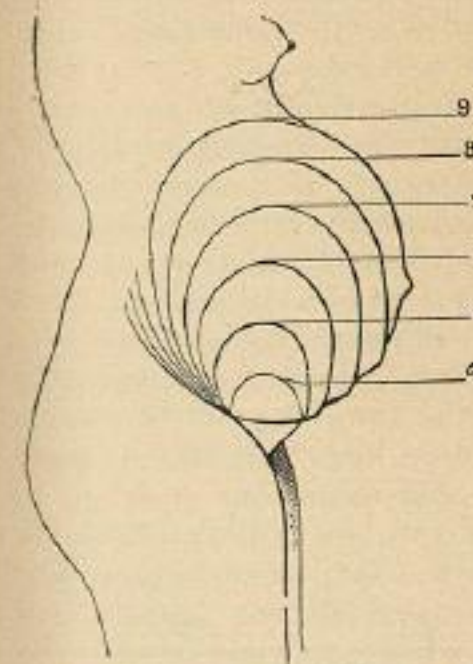
After the ascent of the organ into the abdomen it develops more in the vertical direction, so that at term it has the form of an ovoid, with its large extremity above and its narrow end at the cervix uteri, and its longitudinal axis corresponds to the long diameter of the mother's abdomen, provided the presentation be either of the head or breech. The anterior surface is now even more distinctly projecting than before—a fact which is explained by the proximity of the posterior surface to the rigid spinal column behind, while the anterior is in relation with the lax abdominal parietes, which yield readily to pressure, and so allow of the more marked prominence of the anterior uterine wall.

Before the gravid uterus has risen out of the pelvis no appreciable increase in the size of the abdomen is perceptible. On the contrary, it is an old observation that at this early stage of pregnancy the abdomen is flatter than usual, on account of the partial descent of the uterus in the pelvic cavity as a result of its increased weight. As the growth of the organ advances, it soon becomes too large to be contained any longer within the pelvis, and about the middle of the third or the beginning of the fourth month the fundus rises above the pelvic brim—not suddenly, as is often erroneously thought, but slowly and gradually—when it may be felt as a smooth rounded swelling.

It is about this time that the movements of the fœtus first become appreciable to the mother, when "quickening" is said to have taken

place. Toward the end of the fourth month the uterus reaches to about three fingers' breadth above the symphysis pubis. About the fifth month it occupies the hypogastric region, to which it imparts a marked projection, and the alteration in the figure is now distinctly perceptible to visual examination. About the sixth month it is on a level with, or a little above, the umbilicus (Fig. 73). About the seventh month it is about two inches above the umbilicus, which is now projecting and prominent, instead of depressed, as in the non-pregnant state. During the eighth and ninth months it continues to increase until the summit of the fundus is immediately below the ensiform cartilage (Fig. 74). A more accurate estimate of the size of the uterine tumor at various periods of pregnancy can be obtained by measuring the distance between the fundus uteri and the upper margin of the symphysis pubis either with callipers or a measuring tape. The accompanying table gives the dimensions from the measurements of Spiegelberg<sup>1</sup> and Sutugin.<sup>2</sup>

FIG. 74.



Size of uterus at various periods of pregnancy.

<sup>1</sup> Lehrbuch der Geb., Bd. II. S. 115.  
<sup>2</sup> Obst. Journ. of Great Britain and Ireland, 1875, vol. iii.



SIZE OF UTERUS AT VARIOUS STAGES OF PREGNANCY.

Week of pregnancy.	Height of fundus uteri above pubes, measured by tape (Spiegelberg).	Height of fundus uteri above pubes, measured by callipers (Sutugin).
22d	8.5 inches	6.0 inches
24th		6.6 "
26th	10.5 "	7.3 "
28th		7.8 "
30th	11.0 "	8.3 "
32d	11.5 "	8.7 "
34th	12.0 "	9.0 "
36th	12.5 "	9.3 "
38th	13.0 "	9.6 "
40th	13.2 "	10.0 "

The former employed a tape measure, the latter used callipers, and his results are, therefore, more accurate.

A knowledge of the size of the uterine tumor at various periods of pregnancy, as thus indicated, is of considerable practical importance, as forming the only guide by which we can estimate the probable period of delivery in certain cases in which the usual data for calculation are absent, as, for example, when the patient has conceived during lactation.

For about a week or more before labor the uterus generally sinks somewhat into the pelvic cavity, in consequence of the relaxation of the soft parts which precedes delivery, and the patient now feels herself smaller and lighter than before. This change is familiar to all childbearing women, to whom it is known as "the lightening before labor."

While the uterus remains in the pelvis its longitudinal axis varies in direction, much in the same way as that of the non-pregnant uterus, sometimes being more or less vertical, at others in a state of anteversion or partial retroversion. These variations are probably dependent on the distention or emptiness of the bladder, as its state must necessarily affect the position of the movable body poised behind it. After the uterus has risen into the abdomen, its tendency is to project forward against the abdominal wall, which forms its chief support in front. In the erect position the long axis of the uterine tumor corresponds with the axis of the pelvic brim, forming an angle of about 30° with the horizon. In the semi-recumbent position, on the other hand, as Duncan<sup>1</sup> has pointed out, its direction becomes much more nearly vertical. In women who have borne many children, the abdominal parietes no longer afford an efficient support, and the uterus is displaced anteriorly, the fundus in extreme cases even hanging downward.

In addition to this anterior obliquity, on account of the projection of the spinal column, the uterus is very generally also displaced laterally, and sometimes to a very marked degree, so that it may be felt entirely in one flank, instead of in the centre of the abdomen. In a large proportion of cases this lateral deviation is to the right side, and

<sup>1</sup> Researches in Obstetrics, p. 10.

many hypotheses have been brought forward to explain this fact, none of them being satisfactory. Thus, it has been supposed to depend on the greater frequency with which women lie on their right side during sleep, on the greater use of the right leg during walking, on the supposed comparative shortness of the right round ligament, which drags the tumor to that side, or on the frequent distention of the rectum on the left side, which prevents the uterus being displaced in that direction. Of these the last is the cause which seems most constantly in operation, and most likely to produce the effect.

The cervix must obviously adapt itself to the situation of the body of the uterus. We find, therefore, that in the early months, when the uterus lies low in the pelvis, it is more readily within reach. After the ascent of the uterus, it is drawn up, and frequently so much as to be reached with difficulty. When the uterus is much anteverted, as is so often the case, the os is displaced backward, so that it cannot be felt at all by the examining finger.

Toward the end of pregnancy the greater part of the anterior surface of the uterus is in contact with the abdominal wall, its lower portion resting on the posterior surface of the symphysis pubis. The posterior surface rests on the spinal column, while the small intestines are pushed to either side, the large intestines surrounding the uterus like an arch.

Changes in the Uterine Parietes.—The great distention of the uterus during pregnancy was formerly supposed to be mainly due to the mechanical pressure of the enlarging ovum within it. If this were so, then the uterine walls would be necessarily much thinner than in the non-pregnant state. This is well known not to be the case, and the immense increase in the size of the uterine cavity is to be explained by the hypertrophy of its walls. At the full period of pregnancy the thickness of the uterine parietes is generally about the same as that of the non-pregnant uterus, rather more at the placental site, and less in the neighborhood of the cervix. Their thickness, however, varies in different places, and in some women they are so thin as to admit of the fetal limbs being very readily made out by palpation. Their density is, however, always much diminished, and, instead of being hard and inelastic, they become soft and yielding to pressure. This change coincides with the commencement of pregnancy, of which it forms, as recognizable in the cervix, one of the earliest diagnostic marks. At a more advanced period it is of value as admitting a certain amount of yielding of the uterine walls to movements of the fetus, thus lessening the chance of their being injured. Bandl has pointed out that during the latter months of pregnancy the lower segment of the uterus, to a distance of from four to six inches above the inner os, is thinner and less vascular than the tissues of the body of the uterus above. This thinner portion is separated from that above it by a ridge, often easily made out when the hand has to be inserted into the uterus after delivery, known as "Bandl's ring."<sup>1</sup>

<sup>1</sup> Ueber das Verhalten des Uterus und Cervix in der Schwangerschaft und während der Geburt, 1876.



**Changes in the Cervix during Pregnancy.**—Very erroneous views have long been taught, in most of our standard works on midwifery, as to the changes which occur in the cervix uteri during pregnancy. It is generally stated that, as pregnancy advances, the cervical cavity is greatly diminished in length, in consequence of its being gradually drawn up so as to form part of the general cavity of the uterus, so that in the latter months it no longer exists. In almost all

FIG. 75.

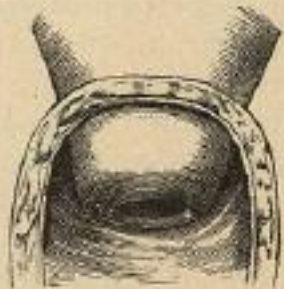


FIG. 76.

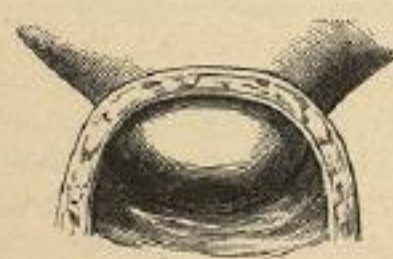


FIG. 77.



FIG. 78.



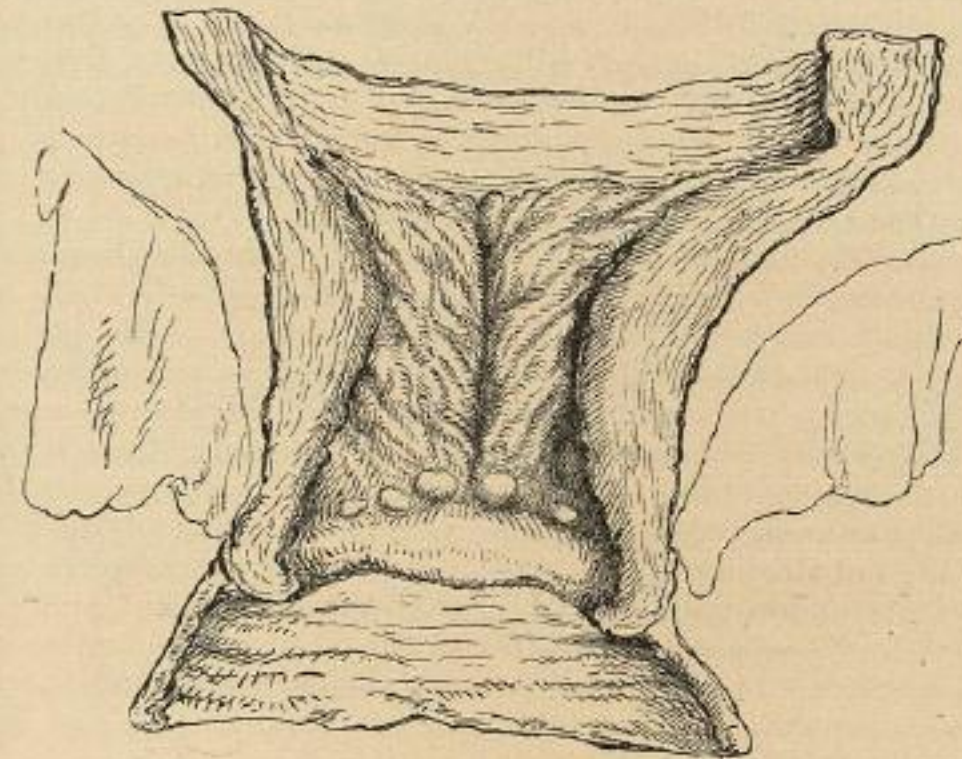
Supposed shortening of the cervix at the third, sixth, eighth, and ninth months of pregnancy, as figured in obstetric works.

midwifery works accurate diagrams are given of this progressive shortening of the cervix (Figs. 75 to 78). The cervix is generally described as having lost one-half of its length at the sixth month, two-thirds at the seventh, and to be entirely obliterated in the eighth and ninth. The correctness of these views was first called in question in recent times by Stoltz, in 1826, but Dr. Duncan,<sup>1</sup> in an elaborate historical paper on the subject, has shown that Stoltz was anticipated by Weitbrech in 1750, and to a less degree by Roederer and other writers. Their opinion is now pretty generally admitted to be correct, and is upheld by Cazeaux, Arthur Farre, Duncan, and most modern obstetricians. Indeed, various *post-mortem* examinations in advanced pregnancy have shown that the cavity of the cervix remains in reality of its normal length of one inch, and it can often be measured during life by the examining finger, on account of its patulous state (Fig. 79). During the fortnight immediately preceding delivery, however, a real shortening or obliteration of the cervical cavity takes place, commencing above, until the cervical canal is merged into the uterine cavity; but this, as Duncan has pointed out, seems to be due to the incipient uterine contractions which prepare the cervix for labor.

<sup>1</sup> *Researches in Obstetrics.*

There is, no doubt, an apparent shortening of the cervix always to be detected during pregnancy, but this is a fallacious and deceptive feeling, due to the softness of the tissue of the cervix, which is exceedingly characteristic of pregnancy, and which to an experienced finger affords one of its best diagnostic marks.

FIG. 79.



Cervix from a woman dying in the eighth month of pregnancy. (After DUNCAN.)

In the non-pregnant state the tissue of the cervix is hard, firm, and inelastic. When conception occurs, softening begins at the external os, and proceeds gradually and slowly upward until it involves the whole of the cervix. It results from serous infiltration of the tissues, associated with passive dilatation of the vessels. By the end of the fourth month both lips of the os are thick, softened, and velvety to the touch, giving a sensation likened by Cazeaux to that produced by pressing on a table through a thick, soft cover. By the sixth month at least one-half of the cervix is thus altered, and by the eighth the whole of it, and so much so that at this time those unaccustomed to vaginal examination experience some difficulty in distinguishing it from the vaginal walls. It is this softening, then, which gives rise to the apparent shortening of the cervix so generally described, and it is an invariable concomitant of pregnancy, except in some rare cases in which there has been antecedent morbid induration and hypertrophic elongation of the cervix. If, therefore, on examining a woman supposed to be advanced in pregnancy, we find the cervix to be hard and projecting into the vaginal canal, we may safely conclude that pregnancy does not exist. The existence of softening, however, it must be remembered, will not itself justify an opposite conclusion, as it may



be produced, to a very considerable extent, by various pathological conditions of the uterus.

At the same time that the tissue of the cervix is softened, its cavity is widened, and the external os becomes patulous. This change varies considerably in primiparæ and multiparæ. In the former the external os often remains closed until the end of pregnancy; but even in them it generally becomes more or less patulous after the seventh month, and admits the tip of the examining finger. In women who have borne children this change is much more marked. The lips of the external os are in them generally fissured and irregular, from slight lacerations of its tissue in former labors. It is also sufficiently open to admit the tip of the finger, so that in the latter months of pregnancy it is often quite possible to touch the membranes, and through them to feel the presenting part of the child.

The remarkable increase in size of the uterus during pregnancy is, as we have seen, chiefly to be explained by the growth of its structures, all of which are modified during gestation. The peritoneal covering is considerably increased, so as still to form a complete covering to the uterus when at its largest size. William Hunter supposed that its extension was effected rather by the unfolding of the layers of the broad ligament than by growth. That the layers of the broad ligament do unfold during gestation, especially in the early months, is probable; but this is not sufficient to account for the complete investment of the uterus, and it is certain that the peritoneum grows *pari passu* with the enlargement of the uterus. In addition, there is a new formation of fibrous tissue between the peritoneal and the muscular coats, which affords strength, and diminishes the risk of laceration during labor.

The hypertrophy of the muscular tissue of the uterus is, however, the most remarkable of the changes produced by pregnancy. Not only do the previously existing rudimentary fibre-cells become enormously increased in size—so as to measure, according to Kölliker, from seven to eleven times their former length, and from two to five times their former breadth—but new unstriped fibres are largely developed, especially in the inner layers. These new cells are chiefly found in the first months of pregnancy, and their growth seems to be completed by the sixth month. The connective tissue between the muscular layers is also largely increased in amount. The weight of the muscular tissue of the gravid uterus is, therefore, much increased, and it has been estimated by Heschl that it weighs at term from 1 to 1.5 lb., that is, about sixteen times more than in the unimpregnated state. This great development of the muscular tissue admits of its dissection in a way which is quite impossible in the unimpregnated state, and the researches of Helié (p. 62) enable us to understand much better than before how the muscles forming the walls of the gravid uterus act during the expulsion of the child.

The changes in the mucous coat of the uterus which result in the formation of the decidua have already been discussed at length elsewhere (p. 102).

The circulatory apparatus of the uterus during pregnancy has been

described when the anatomy of the placenta was under consideration (p. 115).

The lymphatics are much increased in size; and recent theories on the production of certain puerperal diseases attribute to them a more important action than has been commonly assigned to them.

The question of the growth of the nerves has been hotly discussed. Robert Lee took the foremost place among those who maintained that the nerves of the uterus share the general growth of its other constituent parts. Dr. Snow Beck, however, believed that they remain of the same size as in the unimpregnated state, and this view is supported by Hirschfeld, Robin, and other recent writers. Robin thought that there is an apparent increase in the size of the nerve-tubes, which, however, is really due to increase in the neurilemma. Kilian describes the nerves as increasing in length but not in thickness, while Schroeder states that they participate equally with the lymphatics in the enlargement the latter undergo. Whichever of these views may ultimately be found to be correct, it is certain that analogy would lead us to expect an increase of nervous as well as of vascular supply.

**General Modifications in the Body produced by Pregnancy.**—It is not in the uterus alone that pregnancy is found to produce modifications of importance. There are few of the more important functions of the body which are not, to a greater or less extent, affected; to some of these it is necessary briefly to direct attention, inasmuch as, when carried to excess, they produce those disorders which often complicate gestation, and which prove so distressing and even dangerous to the patients. Such of them as are apparent and may aid us in diagnosis are discussed in the chapter which treats of the signs and symptoms of pregnancy; in this place it is only necessary to refer to those which do not properly fall into that category.

Amongst those which are most constant and important are the alterations in the composition of the blood. The opinion of the profession on this subject has, of late years, undergone a remarkable change. Formerly it was universally believed that pregnancy was, as the rule, associated with a condition analogous to plethora, and that this explained many characteristic phenomena of common occurrence, such as headache, palpitation, singing in the ears, shortness of breath, and the like. As a consequence it was the habitual custom, not yet by any means entirely abandoned, to treat pregnant women on an antiphlogistic system; to place them on low diet, to administer lowering remedies, and very often to practise venesection, sometimes to a surprising extent. Thus it was by no means rare for women to be bled six or eight times during the latter months, even when no definite symptoms of disease existed; and many of the older authors record cases where depletion was practised every fortnight as a matter of routine, and, when the symptoms were well marked, even from fifty to ninety times in the course of a single pregnancy.

**Composition of the Blood in Pregnancy.**—Numerous careful analyses have conclusively proved that the composition of the blood during pregnancy is very generally—perhaps it would not be too



much to say always—profoundly altered. To meet the necessities of the largely increased vascular arrangements of the uterus, the total amount of blood in the system is increased.<sup>1</sup> It is found to be more watery, its serum is deficient in albumin, and the amount of colored globules is materially diminished, averaging, according to the analysis of Becquerel and Rodier, 111.8 against 127.2 in the non-gravid state. At the same time the amount of fibrin and of extractive matter is considerably increased. The latter observation is of peculiar importance, and it goes far to explain the frequency of certain thrombotic affections observed in connection with pregnancy and delivery; this hyperinosis of the blood is also considerably increased after labor by the quantity of effete material thrown into the mother's system at that time, to be got rid of by her emunctories. The truth is, that the blood of the pregnant woman is generally in a state much more nearly approaching the condition of anæmia than of plethora, and it is certain that most of the phenomena attributed to plethora may be explained equally well and better on this view. These changes are much more strongly marked at the latter end of pregnancy than at its commencement, and it is interesting to observe that it is then that the concomitant phenomena alluded to are most frequently met with. Cazeaux, to whom we are chiefly indebted for insisting on the practical bearing of these views, contends that the pregnant state is essentially analogous to chlorosis, and that it should be so treated. More recently the accurate observations of Willcocks<sup>2</sup> have shown that the blood of pregnancy differs from that of chlorosis in the fact that while in both the amount of hæmoglobin is lessened, in pregnancy the individual blood-cells are not impoverished as they are in chlorosis, but simply lessened in comparative number, owing to an increase in the water of the plasma, due to the progressive enlargement of the vascular area during gestation. Objection has not unnaturally been taken to Cazeaux's theory, as implying that a healthy and normal function is associated with a morbid state, and it has been suggested that this deteriorated state of the blood may be a wise provision of Nature instituted for a purpose we are not as yet able to understand. It may certainly be admitted that pregnancy, in a perfectly healthy state of the system, should not be associated with phenomena in themselves in any degree morbid. It must not be forgotten, however, that our patients are seldom—we might safely say never—in a state that is physiologically healthy. The influence of civilization, climate, occupation, diet, and a thousand other disturbing causes that, to a greater or less degree, are always to be met with, must not be left out of consideration. Making every allowance, therefore, for the undoubted fact that pregnancy *ought* to be a perfectly healthy condition, it must be conceded, I think, that in the vast majority of cases coming under our notice it is not entirely so; and the deductions drawn by Cazeaux, from the numerous analyses of the blood of pregnant women, seem to point strongly to the conclusion that the general blood-state is tending to

<sup>1</sup> Arch. f. Gynäk., 1872, Bd. iv. S. 112.

<sup>2</sup> "Comparative Observations on the Blood in Chlorosis and Pregnancy," by Fred. Willcocks, M.D., The Lancet, December 3, 1881.

poverty and anæmia, and that a depressing and antiphlogistic treatment is distinctly contra-indicated.

**Modifications in certain Viscera.**—Closely connected with the altered condition of the blood is the physiological hypertrophy of the heart, which is now well known to occur during pregnancy. This was first pointed out by Larcher in 1828, and it has been since verified by numerous observers. It seems to be constant and considerable, and to be a purely physiological alteration intended to meet the increased exigencies of the circulation which the complex vascular arrangements of the gravid uterus produce. The hypertrophy is limited to the left ventricle; the right ventricle, as well as both auricles, being unaffected. Blot estimates that the whole weight of the heart increases one-fifth during gestation. The more recent researches of Löhlein<sup>1</sup> render it probable that the hypertrophy is less than those authors have supposed. According to Duroziez<sup>2</sup> the heart remains enlarged during lactation, but diminishes in size immediately after delivery in women who do not suckle, while in women who have borne many children it remains permanently somewhat larger than in nullipare. Similar increase in the size of other organs has been pointed out by various writers, as, for example, in the lymphatics, the spleen, and the liver. Tarnier states that in women who have died after delivery, the organs always show signs of fatty degeneration. According to Gassner, the whole body increases in weight during the latter months of pregnancy, and this increase is somewhat beyond that which can be explained by the size of the womb and its contents.

**Formation of Osteophytes.**—Irregular bony deposits between the skull and the dura mater, in some cases so largely developed as to line the whole cranium, have been so frequently detected in women who have died during parturition that they are believed by some to be a normal production connected with pregnancy. Ducrest found these osteophytes in more than one-third of the cases in which he performed post-mortem examinations during the puerperal period. Rokitansky, who corroborated the observation, believed this peculiar deposit of bony matter to be a physiological, and not a pathological, condition connected with pregnancy; but whether it be so, or how it is produced, has not yet been satisfactorily determined.

**Changes in the Nervous System.**—More or less marked changes connected with the nervous system are generally observed in pregnancy, and sometimes to a very great extent. When carried to excess they produce some of the most troublesome disorders which complicate gestation, such as alterations in the intellectual functions, changes in the disposition and character, morbid cravings, dizziness, neuralgia, syncope, and many others. They are purely functional in their character, and disappear rapidly after delivery, and may be best described in connection with the disorders of pregnancy.

**Changes in the Respiratory Organs.**—Respiration is often interfered with, from the mechanical results of the pressure of the

<sup>1</sup> Zeitschrift für Geburtshilfe und Gynäk., 1876, Bd. i. S. 482, "Ueber das Verhalten des Herzens bei Schwangeren u. Wöchnerinnen."

<sup>2</sup> Gaz. des Hôpôt., 1868.



enlarged uterus. The longitudinal dimensions of the thorax are lessened by the upward displacement of the diaphragm, and this necessarily leads to some embarrassment of the respiration, which is, however, compensated, to a great extent, by an increase in breadth of the base of the thoracic cavity.

**Changes in the Liver.**—The liver has been observed to show certain changes in pregnancy. Numerous small yellow spots are seen scattered through its substance, varying in size from a pin's head to a millet-seed, and these are produced by fatty deposits in the hepatic cells, which De Sinéty believes to be associated mainly with lactation, and to disappear when that is concluded.

**Changes in the Urine.**—Certain changes, which are of very constant occurrence, in the urine of pregnant women have attracted much attention, and have been considered by many writers to be pathognomonic. They consist in the presence of a peculiar deposit, formed when the urine has been allowed to stand for some time, which has received the name of *kiestein*. Its presence was known to the ancients, and it was particularly mentioned by Savonarola in the fifteenth century, but it has more especially been studied within the last thirty years by Eguisier, Golding Bird, and others. If the urine of a pregnant woman be allowed to stand in a cylindrical vessel, exposed to light and air, but protected from dust, in a period varying from two to seven days, a peculiar flocculent sediment, like fine cotton-wool, makes its appearance in the centre of the fluid, and soon afterward rises to the surface and forms a pellicle, which has been compared to the fat of cold mutton-broth. In the course of a few days the scum breaks up and falls to the bottom of the vessel. On microscopic examination it is found to be composed of fat particles, with crystals of ammoniaco-magnesium phosphates and phosphate of lime, and a large quantity of vibriones. These appearances are generally to be detected after the second month of pregnancy, and up to the seventh or eighth month, after which they are rarely produced. Regnauld explains their absence during the latter months of gestation by the presence in the urine, at that time, of free lactic acid, which increases its acidity, and prevents the decomposition of the urea into carbonate of ammonia. He believes that *kiestein* is produced by the action of free carbonate of ammonia on the phosphate of lime contained in the urine, and that this reaction is prevented by the excess of acid.

Golding Bird believed *kiestein* to be analogous to casein, to the presence of which he referred it, and he states that he has found it in twenty-seven out of thirty cases. Braxton Hicks so far corroborates this view, and states that the deposit of *kiestein* can be much more abundantly produced if one or two teaspoonfuls of rennet be added to the urine, since that substance has the property of coagulating casein. Much less importance, however, is now attached to the presence of *kiestein* than formerly, since a precisely similar substance is sometimes found in the urine of the non-pregnant, especially in anæmic women, and even in the urine of men. Parkes states that it is not of uniform composition, that it is produced by the decomposition of urea, and consists of the free phosphates, bladder mucus, infusoria, and vaginal

discharges. Neugebauer and Vogel give a similar account of it, and hold that it is of no diagnostic value. That it is of interest as indicating the changes going on in connection with pregnancy, is certain; but inasmuch as it is not of invariable occurrence, and may even exist quite independently of gestation, it is obviously quite undeserving of the extreme importance that has been attached to it.

Toward the end of pregnancy sugar may sometimes be detected in the urine, and after delivery and during lactation it exists in considerable abundance; thus, out of thirty-five cases tested in the Simpson Memorial Hospital in Edinburgh during the puerperium, it was found in all, the amount varying from 1 to 8 per cent.<sup>1</sup> Kaltenbach has shown that this temporary glycosuria is due to the presence of milk-sugar in the urine, and that it ceases with the disappearance of milk from the breasts.<sup>2</sup> This physiological glycosuria must be carefully distinguished from true diabetes, which is a grave complication of pregnancy.

Albumin is often present during the latter stages of pregnancy, and it may be transitory and of comparatively little moment, although its presence must always be a cause of some anxiety. Leyden believes that it is most often met with in the second half of a first pregnancy, and it may become chronic, leading to granular atrophy of the kidneys.<sup>3</sup> In some cases it seems to be the result of catarrhal conditions of the bladder, in others it is probably caused by undue arterial tension consequent on pregnancy.

## CHAPTER IV.

### SIGNS AND SYMPTOMS OF PREGNANCY.

IN attempting to ascertain the presence or absence of pregnancy, the practitioner has before him a problem which is often beset with great difficulties, and on the proper solution of which the moral character of his patient, as well as his own professional reputation, may depend. The patient and her friends can hardly be expected to appreciate the fact that it is often far from easy to give a positive opinion on the point; and it is always advisable to use much caution in the examination, and not to commit ourselves to a positive opinion, except on the most certain grounds. This is all the more important because it is just in those cases in which our opinion is most frequently asked that the statements of the patient are of least value, as she is either

<sup>1</sup> Edin. Med. Journ., vol. 1881-82, p. 116.

<sup>2</sup> Zeit. f. Geburt. u. Gyn., 1879, Bd. iv. p. 161, "Die Lactosurie der Wöchnerinnen."

<sup>3</sup> Deutsche med. Wochenschr., 1886, No. 9.