A MODERN PRACTICE OF OBSTETRICS

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"*There's for thy labour*"
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TO OUR TEACHERS, OUR COLLEAGUES, OUR STUDENTS
AND OUR PATIENTS

PREFACE

THE rapidity of the growth of science and technology makes the frequent revision of any text-book essential. In this new edition, discoveries and improvements made during the last few years in the practice of obstetrics have been incorporated. Parts of the text, including the whole chapter on antepartum hæmorrhage, have been rewritten, new figures have been introduced and old ones have been redrawn; among the new subjects discussed are hypotensive drugs, pain during pregnancy, hypofibrinogenæmia and amniotic embolism.

This book sets out the practice of obstetrics based on the experience gained from some 65,000 consecutive deliveries during the past twenty-two years. The ever-widening scope of medicine makes increasing demands on both students and postgraduates. We have, therefore, endeavoured to make the book concise. The normal and common abnormal conditions have been emphasized, while the rarer complications have been but briefly mentioned. Theories have been avoided, except in so far as they have a direct bearing on practical obstetrics or may " serve to whet the genius of young practitioners." With some reluctance we have been forced to omit pure anatomy and physiology, although the applied branches of these subjects have been explained in some detail.

Our aim has been to write upon the subject from a new aspect, and we hope that we have avoided a common failing whereby unsubstantiated statements have found their way from the pages of one text-book to those of another. Where our experience has been at variance with commonly accepted practice we have not feared to break away from tradition, but medicine is never at a standstill and we can only attempt to keep in the forefront of the advancing tide of knowledge.

Once again we have tried to ensure that the book will be of value both to candidates for examinations and to practitioners in the art of obstetrics.

We owe a special debt of thanks to Miss Wendy Lewington for her detailed criticisms, and to our secretaries, Miss D. Henham and Mrs. J. Wingrove, for their industry and efficiency.

Our publishers, as ever, have been extremely patient with us.

D. M. STERN
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Extract from "A Treatise on the Theory and Practice of Midwifery" by William Smellie, 1752

The Requisite Qualifications of Accoucheurs, Midwives and Nurses who attend Lying-in Women

I. OF THE ACCOUCHEUR

THOSE who intend to practise Midwifery, ought first of all to make themselves masters of anatomy, and acquire a competent knowledge in surgery and physick ; because of their connections with the obstetric art, if not always, at least, in many cases. He ought to take the best opportunities he can find, of being well instructed ; and of practising under a master, before he attempts to deliver by himself.

In order to acquire a more perfect idea of the art, he ought to perform with his own hands upon proper machines, contrived to convey a just notion of all the difficulties to be met with in every kind of labour ; by which means he will learn how to use forceps and crotchets with more dexterity, be accustomed to the turning of children, and consequently be more capable of acquitting himself in troublesome cases, that may happen to him when he comes to practise among women : he should also embrace every occasion of being present at real labours, and indeed of acquiring every qualification that may be necessary or convenient for him, in the future exercise of his profession : but, over and above the advantages of education, he ought to be endued with a natural sagacity, resolution, and prudence ; together with that humanity which adorns the owner, and never fails of being agreeable to the distressed patient in consequence of this virtue, he will assist the poor as well as the rich, behaving always with charity and compassion. He ought to act and speak with the utmost delicacy of decorum, and never violate the trust reposed in him, so as to harbour the least immoral or indecent design ; but demean himself in all respects suitable to the dignity of his profession.

II. OF THE MIDWIFE

A MIDWIFE, though she can hardly be supposed mistress of all these qualifications, ought to be a decent sensible woman of a middle age, able to bear fatigue ; she ought to be perfectly well instructed with regard to the bones of the Pelvis, with all the contained parts, comprehending those that are subservient to generation ; she ought to be well skilled in the method of touching pregnant women, and know in what manner the womb stretches, together with the situation of all the abdominal Viscera ; she ought to be perfectly mistress of the art of examination in time of labour, together with all the different kinds of labour, whether natural or preternatural, and the methods of delivering the Placenta ; she ought to live in friendship with the women of the same profession, contending with them in nothing but in knowledge, sobriety, diligence, and patience ; she ought to avoid all reflections upon men-practitioners, and when she finds herself at a loss, candidly have recourse to their assistance : on the other hand, this confidence ought to be encouraged by the man, who, when called, instead of openly condemning her method of practice (even though it should be erroneous), ought to make allowance for the weakness of the sex, and rectify what is amiss without exposing her mistakes. This conduct will as effectually conduce to the welfare of the patient and operate as a silent rebuke upon the conviction of the midwife ; who finding herself treated so tenderly, will be more apt to call for necessary assistance on future occasions, and to consider the accoucheur as a man of honour, and a real friend. These gentle methods will prevent that mutual calumny and abuse which too often prevail among the male and female practitioners ; and redound to the advantage of both : for no accoucheur is so perfect, but that he may err sometimes ; and on such occasions, he must expect to meet with retaliation from those midwives whom he may have roughly used.

Nurses, as well as midwives, ought to be of a middle age, sober, patient, and discreet, able to bear fatigue and watching, free from external deformity, cutaneous eruptions, and inward complaints that may be troublesome or infectious.

TABLE OF CONTENTS

Section I. Normal Pregnancy

CHAPTER I

ANATOMY AND PHYSIOLOGY OF THE DEVELOPING OVUM

"*I trust it will grow to a most prosperous perfection.*"—MEASURE FOR MEASURE, III. i. 273.

THE birth of a baby is preceded for nine months by the state of pregnancy and is followed for six weeks by the puerperium. These three events are not to be regarded as isolated or distinct phenomena but as consecutive stages of a continuous process, and the sharp distinction which is drawn between them is purely arbitrary. However, when the study of Midwifery is undertaken they form three useful branches of the subject, and it becomes a matter of logic therefore to devote attention first to the circumstances and characteristics of pregnancy.

Definition of Pregnancy

Although pregnancy is a condition of frequent occurrence, through which indeed the majority of women pass, agreement as to its precise definition has not yet been reached. The word itself is derived from two Latin words (*pre*, before; and *gignere*, to beget) which indicate that it is the state in existence before the woman gives birth to her child. In obstetric terms therefore normal pregnancy may be defined as the interval between the time of attachment of the embryo to its mother and the time the attachment is interrupted either by the onset of abortion or labour or by death. The intimate association of fœtal and maternal tissues constitutes the essential criterion of pregnancy, for if the ovum becomes fertilized and yet is unable to attach itself, or if it dies before attachment is effected and is discharged during the ensuing menstrual period, the patient cannot be said to have become pregnant. In accordance with this definition pregnancy must come to an end if the fœtus dies *in utero*, although in fact it may continue to remain there for days or weeks, constituting what is then known as retained products of conception.

Pregnancy is a normal phenomenon when it occurs in a healthy woman, and yet it is difficult to conceive the structural and metabolic changes which characterize this process as being strictly physiological; although the act of reproduction is a physiological one for the species concerned, there are many features which indicate that it is pathological for the individual in question.

Early Changes in the Fertilized Ovum

It is known from study of the experimental animal that the fertilized ovum enters the uterus

FIG. 1. Diagram of a Morula.

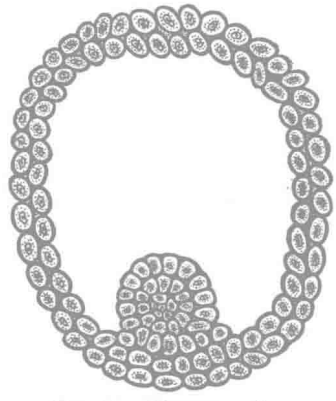

FIG. 2. Diagram of a Blastocyst.

about four days after fertilization, having during this time undergone repeated segmentation until it has developed into a spherical mass of cells measuring about half a millimetre in diameter, known as a morula. This is encapsuled by a delicate thin clear membrane called the zona pellucida, which serves as a support to the segmenting cells and prevents their adherence to the wall of the Fallopian tube. Whilst still within the tube a little fluid collects between the innermost cells and forms a small cavity, thereby converting the morula into a blastocyst. This is a small vesicular structure, 2 mm. in diameter,

consisting of a cellular peripheral capsule to which the name of trophoblast is applied, and a central mass of cells known as the inner cell mass, which lies adjacent to the trophoblast at one pole. In this state the ovum enters the upper part of the uterine cavity where the cells of the trophoblast come into direct contact with the endometrium; here these cells excrete digestive ferments which are responsible for the embedding of the ovum, which occurs between the seventh and ninth days after fertilization.

Formation of the Decidua

Whilst the process of embedding of the ovum is in progress the endometrium of the body of the uterus prepares to receive the implantation by undergoing conversion into the uterine decidua. It is advisable to study this endometrial change before considering the details of the embedding process.

The endometrium during the secretory phase of the normal menstrual cycle which follows ovulation possesses certain well-defined characteristics. It is about 4·5 mm. thick, its tubular glands have become dilated and longer than they were in the proliferative phase of the menstrual

FIG. 3. Drawing of the superficial layer of the endometrium during the secretory phase. (× 285)

cycle prior to ovulation, and they consequently assume a tortuous corkscrew shape. The nuclei of the cells lining the glands are displaced away from the basement membrane by subnuclear vacuoles which are the precursor of the glandular excretion; after the twenty-first day of the cycle the excretion is discharged into the lumina of the glands and the nuclei then sink towards the basement membrane. The stroma during this phase becomes œdematous and vascular, whilst the spindle-shaped stromal cells with their darkly-staining nuclei swell and collect under the surface epithelium from the twenty-first day onwards. The basal lymph nodes are less well marked, and lymphocytes become scattered

FIG. 4. Drawing of the superficial layer of the decidua. (× 285)

throughout the endometrium. In this way three endometrial layers become apparent :

1. A superficial compact layer, formed mainly by the swollen stromal cells.

2. A deeper spongy layer made up of a loose stroma in which figure prominently the dilated uterine glands.

(These two layers comprise the functional layer of the endometrium which measures about 3·5 mm. in thickness.)

3. A thin basal layer of the endometrium, 1 mm. in thickness, which does not participate in these changes. It is from this layer that a new endometrium is formed after menstruation, abortion or labour.

When the blastocyst begins to embed, decidual changes characteristic of pregnancy appear throughout the endometrium of the uterine cavity. This structure now hypertrophies and approaches 6 to 8 mm. in thickness whilst the division of the functional layer into compact and spongy zones becomes more clearly marked; the tortuosity and dilatation of the glands still

further increase, the walls becoming "ferned" with irregular cellular ingrowths, and the excretion is more abundant. The congestion and œdema of the stroma also increase. The feature, however, which is most distinctive of this stage is the altered appearance of the stromal cells. These swell in size and develop enlarged, lightly-staining nuclei and vacuolated cytoplasm; they are massed around the blood vessels, whilst in the superficial layer of the decidua they are so closely packed together that they compress each other and become polygonal in shape. They are now known as decidual cells. When the dilatation of the glands is well marked, the spongy layer of the decidua is called the cavernous layer. This layer plays an important rôle later on when the placenta separates during labour, for it is essentially a weak layer through which tearing can occur and permit placental separation to take place, much in the same way that two postage stamps can be torn apart through the row of perforation holes.

Embedding of the Ovum

As the blastocyst rests against the superficial surface of the endometrium, the ferments excreted by the trophoblast cells digest the endometrial tissues and excavate a small cavity into which the blastocyst enters. The pole which enters first and lies deepest in the endometrium is known as the entering pole and this contains the inner cell mass. On the deep surface of the invading trophoblast a network of thin-walled sinusoidal blood vessels appears in the decidua which constitutes the "sinusoidal reaction." As the process continues the blastocyst advances more and more deeply into the decidua until it lies entirely within it and the decidua closes over behind it. The last portion of the blastocyst to embed is called the closing pole. The site of entry is first closed by a fibrinoid plug called the operculum, and later is covered by proliferation of the surface epithelium. As the blastocyst continues to grow and to enlarge the superficial layer of the decidua becomes a covering for the developing ovum, separating it from the cavity of the uterus into which it progressively bulges. Thus three portions of decidua become demarcated:

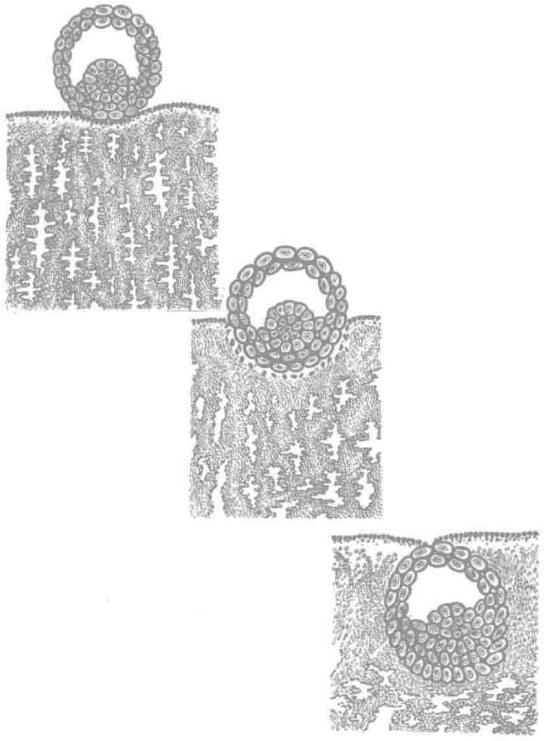

FIG. 5. Diagram illustrating the process of embedding of the fertilized ovum.

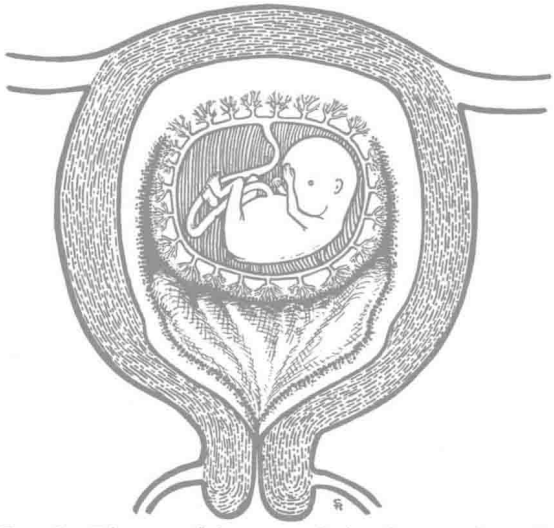

FIG. 6. Diagram of the uterus during the second month of pregnancy.

1. The deeper layer of decidua lying between the developing ovum and myometrium of the uterus, known as the decidua basalis.

2. The superficial layer of decidua covering the developing ovum, known as the decidua capsularis.

3. The remainder of the decidua clothing the uterine cavity and as yet bearing no immediate relation to the developing ovum. This is known as the decidua vera.

As the fertilized ovum enlarges the decidua capsularis approaches and finally fuses with the

decidua vera, and the cavity of the uterus (also known as the decidual space) becomes obliterated. This occurs at the end of the third month of pregnancy. Thus, strictly speaking, the embryo

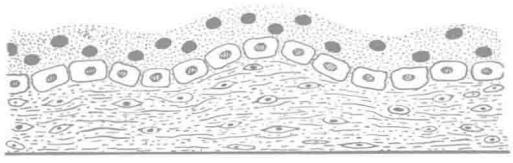

FIG. 7. Diagram showing two layers of trophoblast epithelium resting on a layer of mesenchyme.

and later the fœtus and its membranes never occupy the cavity of the uterus but always lie between the capsular and basal portions of the decidua.

Some authorities question this passive rôle played by the decidua in the phenomenon of embedding, and quote evidence to show that glass beads placed in the uterus of rats during œstrus become implanted as a result of endometrial activity alone. Possibly the trophoblast and decidua each plays a part in the process, but the dominant rôle belongs to the former.

Implantation may occur to varying depths in the decidua; there is some evidence to show that shallow implantation may be a cause of early death of the embryo resulting in early abortion.

Hormone Changes in Early Pregnancy

Pregnancy begins with the process of embedding of the fertilized ovum, and from this time also begin fluctuations in the levels of sex and other hormones throughout the mother's body. When the trophoblast cells excrete ferments to digest the endometrium they elaborate at the same time a hormone. This hormone, chorionic gonadotrophin, or APL principle (so-called because it is anterior-pituitary-like in its action), is produced by active trophoblast tissue, from about the eleventh day after conception until the end of pregnancy. Although it is small in amount at first, it rapidly increases in concentration and reaches a maximum between the fiftieth and sixtieth days of pregnancy. Later it decreases somewhat abruptly about the eightieth day and thereafter remains steady until term. The function of this new hormone resembles that of luteinizing pituitary gonadotrophin (LH) in that it stimulates the growth and function of the corpus luteum which has developed in the Graafian follicle from which the ovum was cast off during ovulation. As a result the corpus luteum grows until it occupies about one-third of the entire ovary by the twelfth week of pregnancy, after which time it becomes smaller and less active. Its history is described in Chapter II, but it is to be noted now that it secretes an increased amount of its hormones, progesterone and œstradiol, into the mother's circulation. It is these hormones which are responsible both for the decidual reaction in the endometrium already described, and also for the increase in size and softness of the uterus which occur as pregnancy progresses and which will be described later.

After the third month of pregnancy the formation of progesterone and œstrogen is taken over by the placenta itself—this is why the excretion of APL is reduced after this time, with consequent shrinkage in the size of the corpus luteum.

Similar changes occur during pregnancy in other species such as the guinea pig, rat, cat and mare, but not in the rabbit, squirrel, mouse, sheep and cow, where the placenta does not produce progesterone and œstrogen, and the corpus luteum in consequence retains its enhanced size and activity for the whole duration of pregnancy.

The chorionic gonadotrophin is excreted in the urine and forms the basis of pregnancy diagnostic tests such as the Aschheim-Zondek test, the Friedman test and the Hogben test which are described in Chapter III. In abnormal trophoblast states such as hydatidiform mole and chorion-epithelioma it is present in abnormally large amounts, whilst if fœtal death occurs during pregnancy it becomes reduced in quantity and finally disappears.

Changes in the Trophoblast

Whilst the blastocyst is becoming embedded in the uterine decidua changes are taking place in the trophoblast and the inner cell mass. The trophoblast becomes differentiated into two

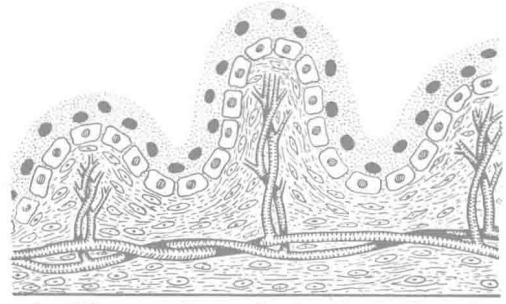

FIG. 8. Diagram of an early stage in the formation of villi.

layers, an outer layer of vacuolated protoplasm free from cell outlines but containing small scattered deeply-staining nuclei, the plasmodiotrophoblast or syncytiotrophoblast, and an inner layer of well-formed cubical cells with lightly-staining oval nuclei, named Langhans' cells, which comprise the cytotrophoblast. Lining the inside of the trophoblast appears a layer of mesoblastic tissue, called the primitive mesenchyme, which is continuous with similar mesenchyme in the inner cell mass, the point of junction between the two being known as the body stalk. A cavity thus exists between the peripheral mesenchyme lining the trophoblast and the central mesenchyme of the inner cell mass—this is known as the mesenchymal cleft or the extra-embryonic cœlom. The multinucleated syncytiotrophoblast on the outside of the blastocyst proliferates rapidly and invades the decidua in all directions; spaces are formed by fusion of the larger vacuoles in the protoplasm, so that an intricate syncytial network results, formed of anastomosing strands of plasmodium with intervening meshes. It can easily be understood that maternal blood vessels and sinusoids in the decidua become eroded by the digestive enzymes which the syncytium excretes, so that bleeding occurs and the spaces in the reticular network become filled with circulating maternal blood (hæmotrophe) which does not coagulate but serves to nourish the rapidly growing tissues of the ovum. This blood-filled space, which is present from the ninth to the twelfth day, is known as the chorio-decidual space.

The trophoblast next becomes converted into the primitive chorion by the appearance of

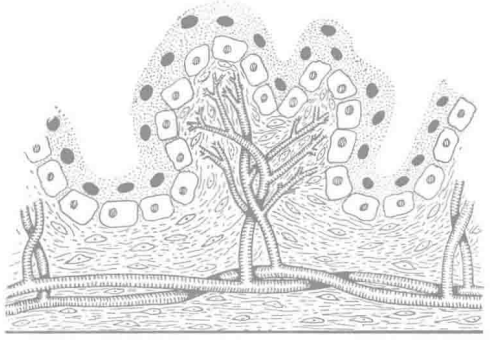

FIG. 9. Diagram showing the arborescent structure of a villus.

chorionic villi which replace the plasmodial network. These are fingerlike projections which grow out from the trophoblast into the decidua; at first they consist of an outer layer of syncytium and an inner layer of Langhans' cells, but they are soon invaded by the mesenchyme and so acquire a mesodermal core. Some of these cells are formed directly by cytomorphosis from the Langhans' cells. This connective tissue is made up of a mucoid intercellular substance lying between scanty branching cells, which later in pregnancy becomes spindle-shaped and more numerous. Round cells with vesicular nuclei and granular cytoplasm are also present in the stroma of the villi particularly in early pregnancy —these are Hofbauer cells and are thought to be histiocytes.

About the third week after fertilization fœtal blood-islands surrounded by vascular walls make their appearance within the mesoderm and soon link up to form a capillary network within the villus. About this time each villus begins to divide first by simple dichotomy and then by repeated branching until an elaborate arborescent structure is produced. Wherever

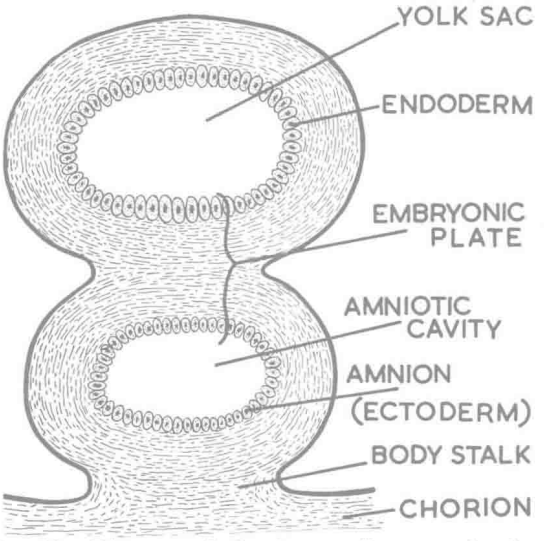

FIG. 10. Diagram of the inner cell mass, showing amniotic cavity and yolk sac.

the villi grow and branch they consist of the same essential pattern, namely, an outer covering of syncytium, a deeper layer of Langhans' cells and a mesodermal core containing fœtal capillaries lined by flat endothelial cells; wherever they penetrate they continue to erode maternal capillaries so that the spaces between the villi, or intervillous spaces, become filled with circulating maternal blood, which bathes the outside of the villi. The chorio-decidual space thus becomes occupied by the villous tree and the intervillous spaces. In places maternal arterioles can be

seen bringing fresh maternal blood into the intervillous spaces, whilst at others small venules drain the blood away to rejoin the general maternal circulation.

The fœtal vessels pass down within the villi, unite at their bases and then converge towards the body stalk and the inner cell mass where they later form the umbilical arteries and vein. They connect with the fœtal heart which starts to beat about the fourth week of pregnancy and so maintains the circulation of the blood through the fœtal vessels. The nutrition of the ovum has thus become more highly organized as there are now two circulations in existence, the maternal circulation outside the villi and the fœtal circulation within; conditions are favourable therefore for nutritive and katabolic substances to pass from one to the other.

The arborescent structure of the villi, however, is not equally developed in all parts of the primitive chorion. The villi which invade the decidua capsularis must of necessity receive less and less nourishment from the maternal sinuses in the decidua as it becomes stretched and attenuated by the growing embryo, and they accordingly proliferate to a less extent than do those which invade the highly vascular decidua basalis. And, in fact, when the pregnancy is advanced to the end of the second month, the villi in the decidua capsularis begin to become avascular and later atrophy and disappear, leaving the primitive chorion quite smooth by the time the end of the third month is reached—this then is known as the chorion læve, which at term becomes the membrane called the chorion. The villi in the decidua basalis, on the other hand, become more and more intricately branched, and constitute the chorion frondosum, which from now on does the work previously done by the whole of the chorion. This in its turn becomes the fœtal part of the placenta. Its size is such that its area of attachment occupies about one-quarter of the area of the uterine wall, and this ratio is maintained approximately from the third month of pregnancy until term. Thus it can be seen that the placenta and chorion at term are derived from the same original structure, namely the primitive chorion, and before that the trophoblast.

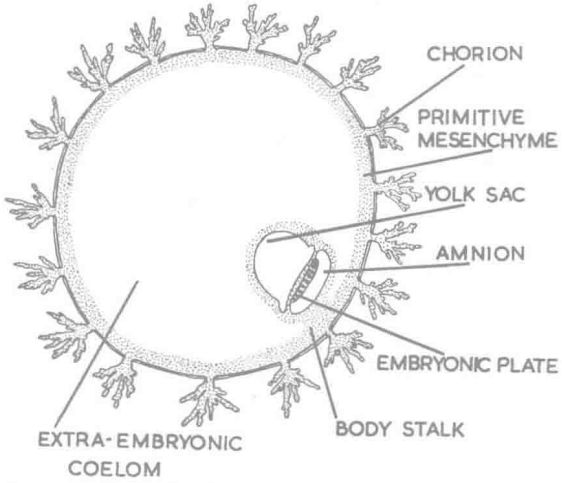

FIG. 11. Early development of the inner cell mass and trophoblast.

The villi which have been described are of two main types. The first type are those which branch and divide in a complex manner and lie free within the maternal blood spaces—these are the nutritive villi. The second type in addition to nutrition also contribute to the stability of the system and fix the placenta within the decidua. This they achieve by reason of their increased length which enables them to pass through the maternal blood sinuses to the deeper part of the decidua, where columns of Langhans' cells pass from the villous tips, where the syncytium is absent, to become continuous with the decidual cells—these villi are appropriately known as anchoring villi. Projections of decidua pass between clumps of villi forming decidual septa, and also spread under the placenta around its periphery for a distance of about two inches and so help to stabilize it—this is the sub-chorionic decidua. The penetration of the decidua by the villi extends very deeply, but in a normal case it does not extend to the basal unchanged layer of decidua or to the myometrium. Excessive villous penetration is prevented by a layer of fibrinoid tissue which is laid down as a protective barrier deep in the decidua, and is known as the layer of Nitabuch.

Changes in the Inner Cell Mass

Whilst the placenta and chorion are developing from the original layers of the trophoblast, changes of equal complexity and importance are occurring in the inner cell mass. Two adjacent cavities appear within the mass of cells, and each becomes lined by a layer of cubical cells; these are the amniotic cavity lined by ectodermal cells and the yolk-sac lined by endodermal cells. The other cells of the inner cell mass form the primitive mesenchyme which is continuous through the body stalk with the mesenchyme lining the chorion. The region between the two cavities becomes invaded by this meso-

blastic tissue and forms embryonic mesoderm, so that there are present in this area cells from all three embryonic layers—ectoderm forming part of the amnion, endoderm constituting the wall of the yolk-sac and mesoderm separating these two layers. Thus this area contains all the formative cells necessary for embryonic development, and receives therefore the name of the embryonic plate. From this plate the embryo is formed and the individual layers give rise to different tissues, thus:

1. Ectoderm produces all nervous tissue, hair, nails, epidermis, lens of the eye, tooth enamel, the stomatodeum or primitive oral cavity, and the proctodeum or primitive anus.

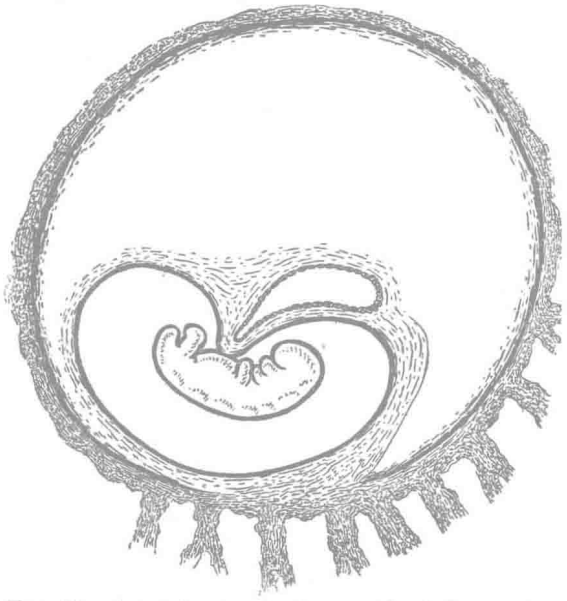

FIG. 12. An early stage in the growth of the amnion.

2. Mesoderm produces the vascular system, bones, muscles, connective tissues, kidneys and gonads.

3. Endoderm produces the gut, liver, pancreas, thyroid gland and lungs.

Whilst the embryo is developing each of the two cavities plays an important rôle in the process:

1. *The Amnion.* The embryo as it grows becomes invaginated as it were into the amniotic cavity, which progressively enlarges in order to accommodate it. As this increase in size continues, the extra-embryonic cœlom becomes smaller and smaller until it is obliterated about the twelfth week of pregnancy by the amnion forming a continuous lining inside the chorion and placenta. When this happens the mesoderm covering the outside of the amnion becomes

FIG. 13. The amnion half fills the gestation sac, showing the incorporation of the yolk sac into the cord, and the progressing obliteration of the extra-embryonic cœlom.

continuous with the mesoderm lining the inside of the chorion and placenta; no actual fusion occurs, however, thereby permitting the two membranes to be easily separated as may be demonstrated after delivery. The fœtus meanwhile is surrounded by the fluid contained in the amniotic cavity—the liquor amnii—and becomes mobile by reason of the lengthening of the body stalk, which is converted into the umbilical cord

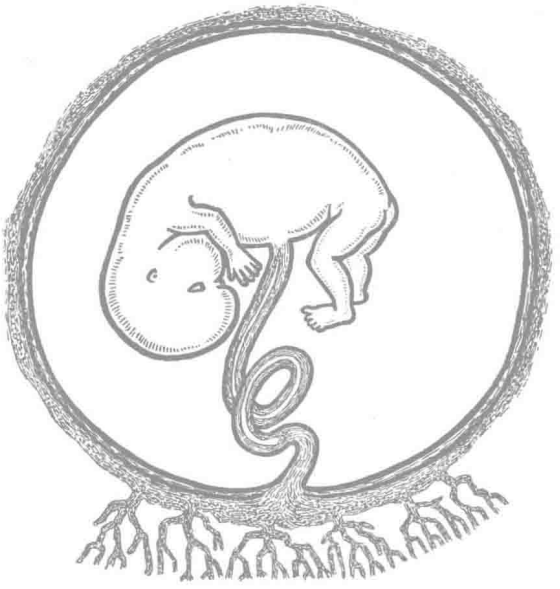

FIG. 14. The fully developed amnion now lines the interior of the chorion and placenta.

running from the centre of the placenta to the umbilicus of the fœtus. In this way, with the expansion of the amniotic cavity, the amnion comes to cover the cord with which it intimately fuses.

2. *The Yolk-sac.* At first the embryo is a small disc floating on the surface of the yolk-sac, but as the head-fold and tail-fold of the embryo develop its body becomes bent ventrally over the yolk-sac, which gradually alters in shape to that of a letter T with an elongated vertical limb. The horizontal limb becomes incorporated into the body of the embryo and forms the gut extending from the stomatodeum to the proctodeum, whilst the vertical limb becomes caught up and lengthened in the elongation of the body stalk which is now taking place. Thus the umbilical cord comes to contain remnants of the attenuated yolk-sac (the omphalo-mesenteric duct) which communicates with the gut in the region of the lower ileum, and this connection may indeed persist in about 2 per cent. of individuals in the form of Meckel's diverticulum.

Development of the Fœtus

A knowledge of the fœtal embryology is of some importance to the obstetrician, who should in the first place be able to correlate the length and size of the fœtus with the period of pregnancy. This relationship is shown in Table I.

TABLE I

Weights and Lengths of Fœtuses of different Ages

Lunar Month of Pregnancy	Crown to Heel Length of Fœtus		Weight of Fœtus
1	5 mm. (crown to rump)	$\frac{1}{5}$ in.	0·0007 oz.
2	3 cm.	$1\frac{1}{4}$ in.	0·035 oz.
3	8 cm.	$3\frac{1}{4}$ in.	$\frac{1}{2}$ oz.
4	16 cm.	$6\frac{1}{4}$ in.	$3\frac{1}{2}$ oz.
5	25 cm.	10 in.	$\frac{1}{2}$ lb.
6	30 cm.	12 in.	$1\frac{1}{2}$ lb.
7	35 cm.	14 in.	$2\frac{1}{4}$ lb.
8	40 cm.	16 in.	$3\frac{1}{2}$ lb.
9	45 cm.	18 in.	5 lb.
10	50 cm.	20 in.	7 lb.

FIG. 15. Fœtus aged $6\frac{1}{2}$ weeks.

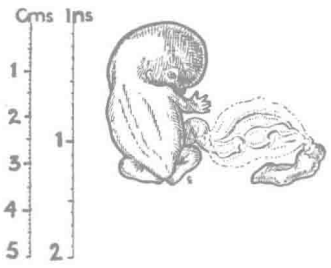

FIG. 16. Fœtus aged 10 weeks.

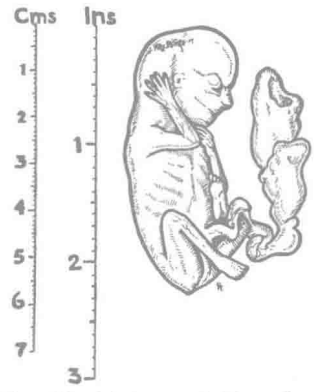

FIG. 17. Fœtus aged 12 weeks.

Haase's rule states that during the first five lunar months the length in centimetres is equal to the square of the month, and during the second five lunar months the length in centimetres divided by five is equal to the month. This, of course, is only approximately true.

It will be seen that growth is much more rapid in the early months, and that although the absolute weight increases rapidly towards the

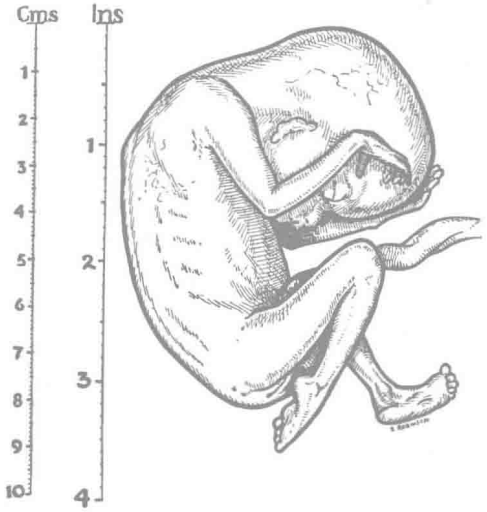

FIG. 18. Fœtus aged 14 weeks.