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The Journal of Obstetrics and Gynæcology of the British Empire

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THE PROBLEM OF THE POSTMATURE INFANT.

BY J. W. BALLANTYNE, M.D., F.R.C.P.E.,

Lecturer on Midwifery, Medical College for Women, Edinburgh; Examiner in Midwifery in the University of Edinburgh.

THE problem of the postmature infant differs in a very striking way from that of the premature infant. The latter can with difficulty be kept in life after birth; the former can with difficulty be born alive. The premature child comes too early into extra-uterine surroundings, and is face to face with the difficulty of behaving in all respects as a new-born infant when he is only a fœtus, and is not prepared to be anything but a fœtus; his troubles begin after birth. The postmature infant, on the other hand, has stayed too long in intra-uterine surroundings; he has remained so long *in utero* that his difficulty is to be born with safety to himself and his mother; his troubles come on during birth. The problem of the premature infant is postnatal; that of the postmature infant is intranatal. In the solving of the former, both the obstetrician and the pediatric physician play a part; the obstetrician alone is concerned with the latter.

Yet the problems present a resemblance; in both it is a disturbance of the time relations of gestation which is the source of the difficulty and the origin of the problem. It were well for the infant if the guiding principle of *nec cito nec tardo* could be established with regard to his advent into extra-uterine surroundings. *Festinare nocet, nocet et cunctatio sæpe*—Hurry is bad, and delay also is often bad:

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'Raw Haste is half-sister to Delay.' Expedition without precipitancy, deliberateness but not procrastination, might well be the rules of conduct in antenatal as well as in postnatal affairs. To be expelled timeously from the uterus is almost as important as to be nourished perfectly in it. To be born too late is likely to be disastrous, and there is danger in being born before the time.

Here, however, the resemblance between the problems ceases; for prematurity gives rise to one kind of deviation from the normal, and postmaturity gives rise to another and a very different kind. The *partus præcox* is one thing, and the *partus serotinus* another, although in both the abnormality lies in the date of the supervention of labour. When the infant loses his time relations it may be questioned whether it is worse for him to come before or after his time into extra-uterine life; but there can be no doubt at all that the risks run by the premature baby are quite unlike those encountered by the postmature. Further, the treatment called for is very dissimilar in the two cases; theoretically, no doubt, it ought to be the same, and should consist in prevention, but in practice it differs markedly, being in the one instance directed towards the infant, and in the other towards the mother, and being in neither truly preventive. There is, then, a strong contrast between the problems, and they call, therefore, for separate consideration. The problem of the premature infant I have dealt with elsewhere (*British Medical Journal*, May 17, 1902); that of the postmature has now to be discussed.

Definition of Postmaturity.

It is comparatively easy to state what is meant by a postmature infant, just as it is easy to explain in a general fashion what is meant by a premature one; but in both cases it is very difficult to fix limits with any degree of accuracy and to give exact definitions of the terms employed.

The difficulty in dealing with the premature infant arose in connection with the definition and delimitation of viability. It was no easy matter to determine when immaturity ceased and prematurity began, for the good reason that there was a variability of viability, and circumstances were found to alter cases. The seven-months infant of healthy parents might be justly termed viable, while the seven-months infant of a syphilitic mother might be as justly termed non-viable. Age does not entirely determine viability. There may apparently be an acceleration or a retardation of the vital

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processes *in utero*, with results which tend to confusion when attempts are made to settle the chronology of antenatal life. So, in treating of the postmature infant, it is a perplexing question to fix the date of maturity and to define overmaturity. By a postmature baby is generally understood a new-born infant weighing more than the average number of pounds, expelled from the uterus at a date later than that which has been regarded (after careful calculation) as the normal date for delivery, and showing certain anatomical and physiological characters belonging to the infant of a few weeks old rather than to the full-time fœtus. This, however, is a short description rather than a definition, and does not meet the requirements of legal accuracy. The premature infant must be viable and less than mature; the postmature infant must not simply be mature, he must be more than mature; he must be not only ripe, but over-ripe. Since both viability and maturity must be regarded as variable, it follows that neither prematurity nor postmaturity can be strictly defined.

It is therefore impossible to fix exactly the date in pregnancy when an infant begins to be postmature; but, further, it is also impossible to state the time beyond which an infant can no longer be retained alive in the uterus. There is no *ultimum tempus pariendi*. For, let it be observed, a prolonged pregnancy need not necessarily result in the birth of a postmature infant; the fœtus may die *in utero* at the full term, and not be expelled for a fortnight or longer. Under these circumstances the labour may be described as postmature, but the product of it is not a postmature infant. Time spent in the uterus, then, is not the only criterion of postmaturity. The fœtus must continue to live on in the uterus after the full term of pregnancy, and one cannot fix the date beyond which it is impossible for it to continue to survive, and to be capable ultimately of live birth. The law, however, which has attempted to fix the earliest date of viability, has also tried to settle the extreme limit of fœtal residence in the uterus, in order to decide vexed questions of legitimacy and paternity. It has not been altogether successful in either case; for in different countries there is a difference in the limit fixed, while in some codes no definite number of days is mentioned at all, and in actual practice the decision come to is often based upon reasons and evidence other than medical. So, in the case referred to by W. A. Thomson (*Trans. Obstet. Soc. Lond.*, xxvii. 308, 1886), in which labour occurred 301 days after coitus and 317 days after the last menses, the child would have been legitimate by Prussian law, illegitimate according to Scottish and French law, while English

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law would have taken into account the moral aspect of the case in coming to a decision. These are circumstances which are eloquent of the uncertainty which exists in the matter.

It may at once be stated that neither the dimensions of the fœtus, nor the degree of development of his tissues and organs, nor the history of the pregnancy, can be taken as certain proof of postmaturity. There are great variations in the weight and measurements of the full-time infant, the condition of the organs and skeleton (*e.g.*, the ossific nuclei in the epiphyses of the long bones) is by no means always the same, and the statements of the parents cannot, of course, be accepted as scientifically accurate, even if there be no reason to doubt their veracity. At the same time, for the purposes of this article, written as it is from the medical rather than from the legal standpoint, it is unnecessary to give an exact definition of post-maturity. I take not an extreme but an average case, not a dubious but an obvious instance. I call that infant postmature who is born after a pregnancy which can be reasonably reckoned as having lasted for ten calendar months (or longer); who has a weight and size greater than what is normal for the mature infant; who has been alive *in utero* for some days, at any rate, after the full term of gestation was passed; and whose organs and tissues exhibit some at least of the characters of postmaturity which are later to be described.

Illustrative Cases.

I. Mrs. A. was thirty-nine years of age when she first became pregnant, and her husband at that time was fifty-five. Her menstruation had always been regular, and of the twenty-eight-day type. She expected her confinement on or about November 16, 1892, but labour pains did not supervene till December 23. The labour was evidently a very prolonged one, for both her own medical man and a consultant were in attendance, and ultimately craniotomy had to be performed in order to extract the child, a large male. She had a miscarriage in August of the next year (1893), and in the spring of 1894 I was engaged to attend her at her confinement, which was expected in July. She had been taking chlorate of potash since she knew she was pregnant for the third time, and this medicine I ordered her to continue till near the full term. From the menstrual history and other details, it was calculated that labour would occur about July 20; but the patient herself assured me that I had better make my arrangements for attending her about August 20, as she had gone past her dates in her first pregnancy. I remained, however,

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in town during the second half of July and the first half of August, awaiting the confinement. My waiting continued till August 20, when, after a prolonged labour, I succeeded, by means of forceps, in extracting a large living male child. A few days after birth the infant developed œdema neonatorum of a very marked type, was seriously ill for about ten days, but thereafter completely recovered. He did not walk, however, till the end of his second year. He is at the present time healthy and strong.

In the August of the next year (1895) my patient aborted for the second time. She became pregnant again in 1895, and, curiously enough, her labour was due once more on July 20. On this occasion I made my arrangements as if it were due on August 20, and as a matter of fact Mrs. A. was delivered of a girl on the 19th of that month. Short forceps were needed in this instance, and the infant was of large size for a female. The patient had in this pregnancy, as in the former one, been taking chlorate of potash. She did not recover so quickly after this confinement, and suffered from menorrhagia and leucorrhœa due to endometritis; I curetted the uterus in the August of the next year (1897). She did not again become pregnant till the autumn of 1899. In this pregnancy I did not advise her to take any chlorate of potash, as I trusted that the curettage might have brought about a healthy condition of the endometrium, and that there would in consequence be less risk of abortion. Labour, by ordinary calculations, was due on April 28, but, being warned by previous experiences, I looked for it about the end of May. Labour pains came on, however, on May 12, or only a fortnight later than the ordinary full term. Forceps were needed. The infant, a female, was a little above the average size and weight. It should be added that the patient was recovering from influenza when labour came on, and that she had alarming primary postpartum hæmorrhage. She made, however, a thoroughly good recovery. She has now (1902) reached the menopause, being forty-nine years old; she is perfectly healthy.

Notes.—In this somewhat remarkable record it is to be noted that the parents were both advanced in years before marriage, and that all the living children (three) were born after the mother was forty years old. There were in all six pregnancies; two of them ended in miscarriage about the third month, and the other four all went beyond the full term. Three of the labours were one month overdue, and one was about a fortnight postmature; possibly in this case the influenza may have expedited the onset of labour pains and so prevented the full degree of postmaturity. In two of the post-

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mature confinements the patient had been taking chlorate of potash in doses of from 20 to 40 grs. daily during the greater part of the pregnancy. In the three labours at which I was in attendance, the fœtal head lay somewhat transversely at the brim, and on all these occasions I used forceps. The children, a boy and two girls, were all large and heavy at birth (I should say they were well above 8 pounds); their heads were all well ossified. They were all nursed by the mother, but they all showed signs of rickets, the youngest one most markedly. None of them walked till the age of two years.

II. Mrs. B. was sent to consult me in 1893 by Dr. A. T. Sloan, of Edinburgh. I had previously examined a still-born infant to which she had given birth on April 6 of that year. The history was as follows: Mrs. B. had had three children in the country, all large and well formed, but all still-born. In her fourth pregnancy she came to town to be under the care of Dr. Sloan. Labour supervened on April 6, 1893—according to the woman's reckoning, three weeks after the full term. There was delay from the large size of the infant, and the use of forceps was necessary to deliver the child, which was still-born and could not be resuscitated, although efforts were made for a long time. The placenta appeared normal; the mother's pelvis was not contracted. I made a series of ten frozen sections of the infant, a male, in order to try to discover the cause of the still-birth. Nine of these sections are reproduced in colour in my work 'Manual of Antenatal Pathology,' where they constitute Plates I. to IX. The infant was so well developed and so mature in appearance that it resembled more a baby of several months than a new-born child. Its weight was 4,780 grm. (about 9½ pounds), the length from vertex to heel was 56 cm., and from vertex to symphysis pubis 36·5 cm. The circumference of the head in the O.F. plane was 38·5 cm., in the O.M. 42·5 cm., and in the S.O.B. 37 cm. The circumference of the trunk round the shoulders was 43·5 cm., at the level of the nipples 36 cm., at that of the ensiform cartilage 40 cm., at that of the umbilicus 37 cm., and at a level an inch above the last-named 39 cm. The thigh measured 19 cm. in girth, the leg 13·5 cm., the upper arm 13 cm., and the forearm 11·5 cm. The infant was, therefore, a large one; but its size alone was not such as to prevent its safe passage through a normal pelvis. The head, however, when viewed from above, was seen to be more nearly square than ovoid in shape, and on closer examination it was found that the anterior fontanelle was scarcely larger than a threepenny piece, and that all the bones were unusually well ossified and

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nearly immovable at the sutures, but the occiput felt loose in its attachments. The infant was put in the freezing mixture, and sections were then made of it—one mesial sagittal in the region of the head, and nine horizontal at various levels in the trunk.

The mesial sagittal section of the head is reproduced in Fig. 1. Unfortunately, the middle line has been missed in the posterior part of the head, and so the spinal cord and medulla are not shown; this result was largely due to the advanced ossification of the cranium, which made it difficult for the saw to keep the mesial plane. Never-

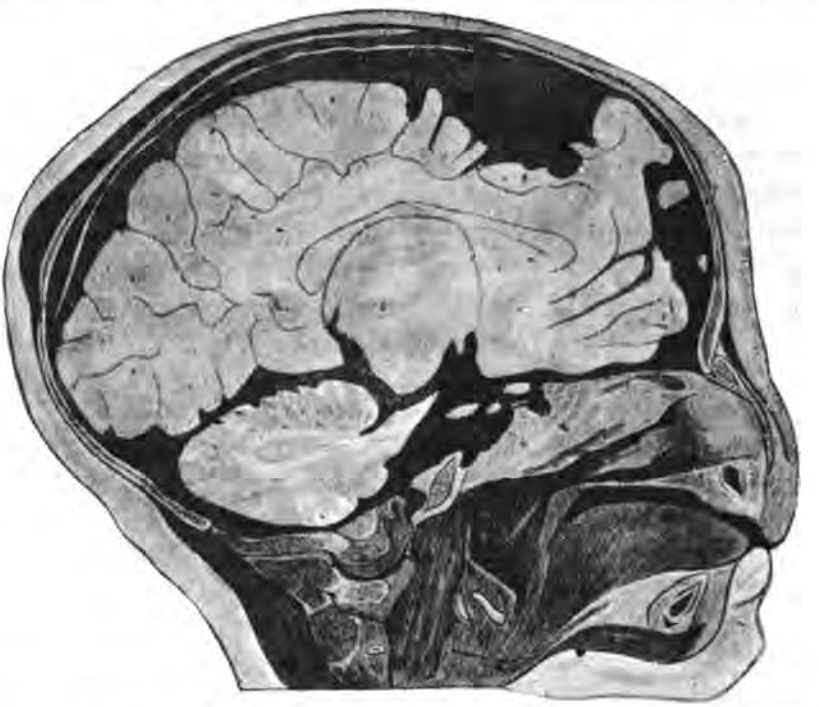


FIG. 1.—SAGITTAL SECTION OF HEAD OF POSTMATURE INFANT, SHOWING SMALL SIZE OF ANTERIOR FONTANELLE, FRACTURES OF OCCIPUT AND FRONTAL BONES, AND EXTENSIVE INTRACRANIAL HÆMORRHAGES. (Reduced by one-third.)

theless, the leading anatomical characters are well displayed. The small size of the anterior fontanelle is very evident; the posterior fontanelle does not exist; there is a fracture of the occiput at the level of its so-called 'cartilaginous hinge' (which in this case was osseous, and not a hinge till fractured); and the frontal bone is driven markedly inwards just above the root of the nose. The brain is unusually well developed. The median aspect of the left hemisphere of the cerebrum is seen in the section (Fig. 1); the corpus callosum and gyrus fornicatus are well displayed, and so are the

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cuneus and precuneus and the associated fissures; a great part of the marginal convolution, however, is obscured from view by blood-clot, and clot also is seen at the basis cranii and around the cerebellum. Further dissection in the region of the neck led to the discovery of blood in the vertebral canal. It is evident, therefore, that the cause of still-birth was intracranial hæmorrhage, due, no doubt, to rupture of the superior longitudinal sinus and to fracture of the cranial bones. It is to be noted that the ossification of all the cranial bones is well advanced, and that there is a plentiful growth of hair on the scalp.

The transverse sections (reproduced in the 'Manual of Antenatal Pathology') showed that the trunk as well as the head of this infant was far advanced in development. The foramen ovale of the heart was nearly closed; the bladder was distended with urine; the lower part of the descending colon, the sigmoid flexure, and the rectum were all overdistended with meconium; the liver did not descend so low in the abdomen as it does in full-time or premature fœtuses; the kidneys showed no signs of lobulation; the thymus gland lay to the right side of the heart rather than to the front of it (being possibly displaced laterally by the large size of the heart, the displacement being also permitted by the undistended state of the right lung); and all the bones and muscles were more than usually well developed, both as regards size and structure.

Notes.—There can be no doubt that in this case the fœtus was both postmature and unusually well developed, for three weeks longer time spent in the uterus could hardly account for the large measurements and for the advanced degree of ossification of the bones. It was for this reason that I advised the patient, if she again became pregnant, to have labour induced at the eighth month. I do not know whether my advice was followed, or, indeed, whether there was ever another pregnancy. There can be no doubt that with such an infant a full-time labour, completed with the help of forceps, became in reality a craniotomy.

III. Mrs. C., a patient under the care of Dr. R. A. Lundie (Edinburgh), gave birth to an anencephalic fœtus in February, 1895. Dr. Lundie gave me the fœtus, and I examined it both by frozen sections and by dissection. I also saw the patient, and obtained from her and from her medical attendant the following interesting history:*

* This history was reported by me under the title of 'A Problem in Antenatal Pathology: Recurrent Monstriparity,' in the *American Journal of Obstetrics*, xli. 577, 1900.

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She was married at the age of twenty-three to a man two years her senior. Within a year thereafter (1889) she gave birth at the full term to a living normal male infant, who still lives. The pregnancy was normal. Two years later (1891) she had her second child, also a boy, under similar happy circumstances, and with a like happy issue. In 1892 she aborted in the second or third month of her third pregnancy, and in 1893 she gave birth to a dead hydrocephalic female fœtus, with absence of the right thumb and radius. The fœtus had been dead for two or three days *in utero;* it weighed 3,270 grm., and had a length of 54 cm.; the placenta, membranes, and cord had, it was stated, a normal appearance. At the time of this confinement it was noted that the mother showed marked imperfect development of the short muscles of both thumbs, and that her mother and a sister suffered from the same anomaly. In 1894 her fifth gestation ended in the birth of a living normal female infant, who still lives.

The patient's next pregnancy (sixth) is the one with which I have here specially to do. It was prolonged to about eleven months, in accordance with the mother's statement, and with calculations based upon the data given by her. It ended in the birth of another female fœtus, weighing 3,520 grm. and measuring 45 cm. in length, and showing quite a number of malformations. It was anencephalic, a fact which probably served to explain why the weight was not greater for the size; it had a localized spina bifida in the lumbar region; one foot was in a condition of talipes calcaneus; the right thumb was malformed and attached by soft tissues only to the hand; and the fœtal membranes and placenta were connected with the margin of the spinal defect by an amniotic band. As Dr. Lundie was not present at the birth of the fœtus, it cannot be determined if the liquor amnii were normal in amount or not; there was no evidence, however, that it had been excessive, and the probabilities are that it was small in quantity.

This happened in 1895. In 1898 another female infant was born, who lived only for five weeks, being delicate from the first. In 1900 this unfortunate woman again gave birth to a female infant, evidently premature, of small size (weight, 1,320 grm.; length, 39 cm.), with absence of both radii, with absence of the right thumb, and with defective development of the left, which was attached to the hand by a narrow piece of skin. This infant was born alive, and survived birth for three days. The placenta was small, and the cord was inserted into the margin of it (battledore). Dissection revealed commencing hydrocephalus. Since 1900 the woman has had a living female child, well formed.

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Notes.—It is an interesting fact in this most remarkable history that postmaturity and prematurity were met with in the same patient. In this respect the case resembled that of Mrs. A. Here, however, there were malformations as well, both of the fœtus and of the placenta and membranes. There seems to be no doubt that the anencephalic fœtus was postmature, and the fact that its weight was comparatively small is not evidence against this, for in anencephaly some 400 or 500 grm. may be safely added to the weight to allow for the absence of the cranial vault and brains.

IV. Mrs. D. was under the care of Dr. Charles Martin, of Newton Abbot, South Devon. She gave birth to a postmature anencephalic fœtus in 1895, in which year Dr. Martin kindly sent me the following details. There was strong evidence that the fœtus had been retained *in utero* alive for ten and a half months, delivery taking place 320 days after the commencement of the last period, and six months after quickening. Its finger and toe-nails had grown much beyond the tips of the digits. There was no hydramnios. The fœtus (anencephalic though it was) weighed 10 pounds; it died during delivery.

Notes.—The fact that this second case of postmaturity with anencephalus of the fœtus occurred so soon after the one noted by Dr. Lundie led me to look into the history of anencephalics. Out of some thirty-five cases which were reported in the *Edinburgh Medical and Surgical Journal*, the *Edinburgh Monthly Journal of Medical Science*, and the *Edinburgh Medical Journal*, I found only one in which the pregnancy was said to have been prolonged (a fortnight past the full term). This was the case noted by Dr. Frazer in the *Edinburgh Medical Journal*, vol. xvii., p. 78, 1871-72. I was inclined to think that perhaps the absence of the cranial vault along with the absence of hydramnios might in these two cases have tended to allow pregnancy to be protracted. Certainly, in most cases of anencephalus labour occurs prematurely, but then there is usually hydramnios to overdistend the uterus and excite labour pains. I did not, however, speculate much concerning the matter, for there were evidently many factors involved; and I dismissed the question from my mind, with the reflection that the association of postmaturity and anencephalus was probably a coincidence and not a consequence. In 1900, however, my attention was drawn anew to the subject by the occurrence of the case now to be recorded.

V. Miss E.—On June 13, 1900, Dr. C. Kennedy sent to me for examination an anencephalic fœtus which had been born that morning. It was a male and illegitimate. The mother's last menstrual

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period had been the middle of June, 1899, and it was alleged that coitus took place on June 21 and on July 21 of that year, and not again until the end of October. The fœtal movements were felt early in December. The birth was expected in the beginning of April, 1900, but did not occur till June 13. The fœtus was very large; although it was anencephalic, yet it weighed 4,490 grm. (9 pounds), and had a length of 55 cm. The placenta weighed 675 grm., and had a diameter of from 16 to 17·5 cm. It had been a forceps case, and there had been great delay in getting the enormous shoulders through the vulva. There was no hydramnios. The anencephalic head had presented, and there had been difficulty in getting the forceps to hold. Before this pregnancy the mother, who was a healthy, well-made woman of thirty years, had never missed a menstrual period, but had been somewhat irregular, going six weeks at one time and three weeks at another. She suffered from very slight sickness in the pregnancy.

The sectional appearances of this anencephalic fœtus are represented in Fig. 2, a sagittal section of the head and trunk. The representation gives no real idea of the great bulk of the fœtus; for it must be borne in mind that it is reduced to one-third the natural size (*circa*). The circumference of the shoulders was 42 cm., that of the abdomen at the level of the umbilicus 34 cm.; that of the thigh 21 cm.; of the leg 13 cm.; of the upper arm 14 cm.; and that of the forearm 11·5 cm. From vertex to perineum measured 36 cm. The subcutaneous adipose tissue of the thigh was nearly 2 cm. in depth. Above the lumbar region the section has passed to the left of the middle line, a circumstance due partly to an inclination of the vertebral column to the side, and partly to the marked ossification, which made sawing difficult. The sectional appearances present a curious blending of postmature and premature features; and further dissection confirmed this observation. For instance, the bodies of the vertebræ were unusually far advanced in ossification, while the bones of the cranial vault, with the exception of part of the supra-occiput, were not developed at all. Again, the liver had a size and relation to the spine and umbilicus more in accordance with infantile than fœtal conditions, while the testicles were undescended and lay over the internal inguinal rings. The greatest part of the meconium was low down in the large intestine, yet a loop of the sigmoid flexure still occupied the pelvic cavity (lying behind the bladder). The nails were well developed, and projected beyond the digits, yet on microscopic examination of the skin (of the thigh) no hairs could be seen. The organs of the neck

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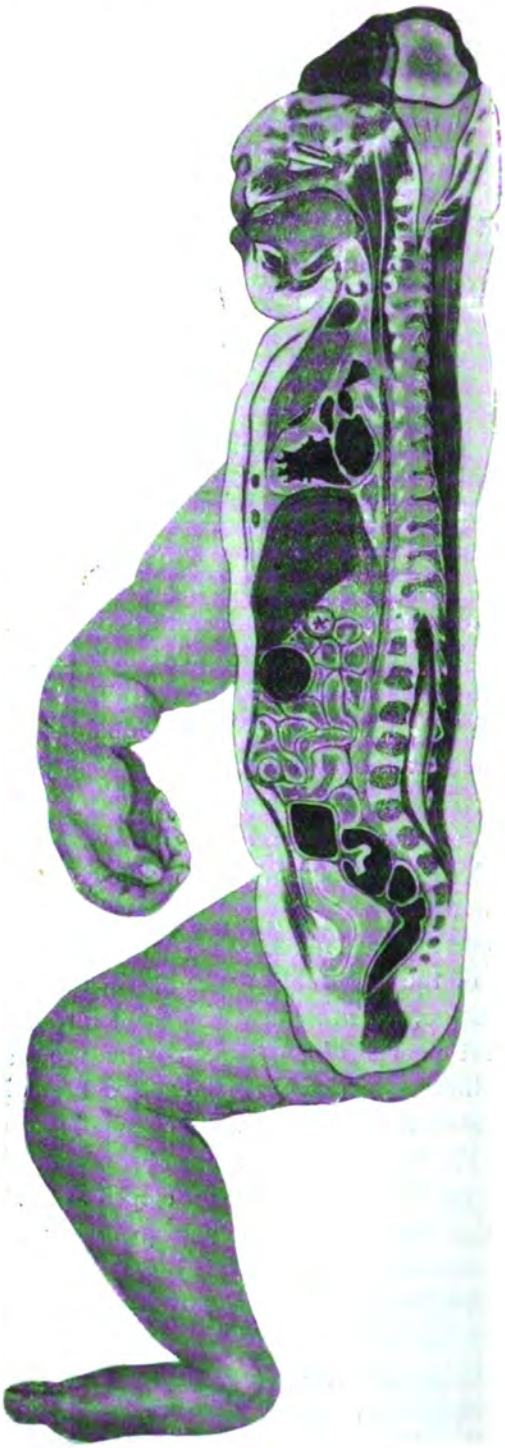


FIG. 2.—SAGITTAL SECTION OF ANENCEPHALIC POSTMATURE FŒTUS, SHOWING ANATOMICAL PECULIARITIES DESCRIBED IN THE TEXT. (One-third natural size.)

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(hyoid, larynx, thyroid, gland, epiglottis) were all at a lower level than they usually are in the fœtus, and yet the stomach had its fœtal size, shape, and relations (it lay entirely under the left lobe of the liver). The foramen ovale was nearly closed (the section, unfortunately had passed through it), and I failed to pass a probe through the ductus arteriosus, yet, on the other hand, the ears were poorly developed and crumpled. And so on, and so on, instances might be given of this conjoined imperfect and extra perfect development of parts.

On the whole, however, the imperfectly developed parts are mostly those which are related to the special malformation which was here present—*i.e.*, the anencephalic monstrosity (cranial vault bones, ears). The rest of the skeleton shows very distinctly an advanced stage of ossification. The sternum, for instance, possessed five well-marked ossific nuclei (this is not shown in the plate, on account of the section being to the left of the middle line, but was evident on dissection); all the sacral vertebral bodies and one at least of the coccygeal were osseous; the ossific nucleus in the lower epiphysis of the femur was very large (it measured fully 7 mm. in diameter), and there was also an ossific centre in the head of the tibia; and the basis cranii was well ossified.

One or two other points in the anatomy of this postmature fœtus may be noted. The promontory of the sacrum was formed by the twenty-fourth vertebra instead of by the twenty-fifth. This character may perhaps be looked upon as a sign of defective development; Tridondani's researches on 'pelves of assimilation' (*Annali di Ostetricia*, xxiv. 1, 1902), at any rate, seem to point to this peculiarity in the formation of the promontory as a temporary one in the development. The umbilicus lay opposite to the junction of the third and fourth lumbar vertebræ. It is to be noted that this is its adult level; in the full-time fœtus it is usually one vertebral body lower (disc between fourth and fifth lumbar vertebræ). As has already been stated, the cervical structures were not situated so high as is usual in the fœtus (the hyoid bone lay opposite the third cervical vertebra, the epiglottis lay opposite the disc between the third and fourth cervical, the thyroid isthmus lay opposite the seventh cervical and the first dorsal vertebræ, etc.); but it cannot be claimed that this also is a sign of postmaturity, for, curiously enough, I found this low level of the cervical structures in a *premature* anencephalic fœtus some years ago (*Journal of Anatomy and Physiology*, xxvi. 516, 1892).

I was fortunate to be able to examine the placenta, membranes,

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and umbilical cord of this postmature fœtus. I commenced to investigate their condition with a view to ascertaining whether they

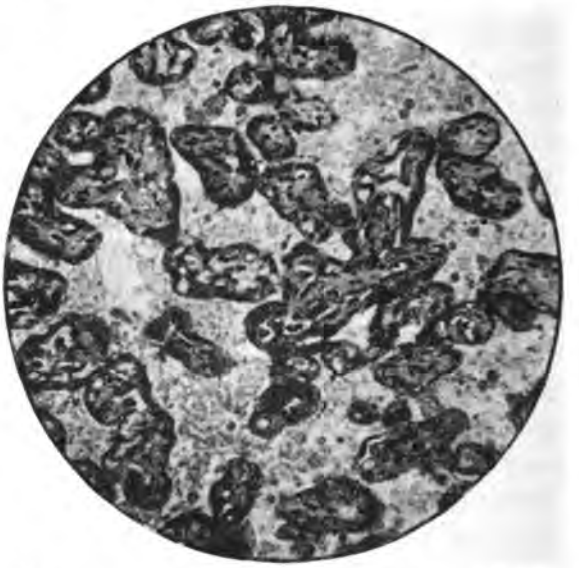


FIG. 3.—MICROSCOPIC SECTION OF PLACENTA FROM CASE OF POSTMATURITY, SHOWING THE CONDITION OF THE VILLI.

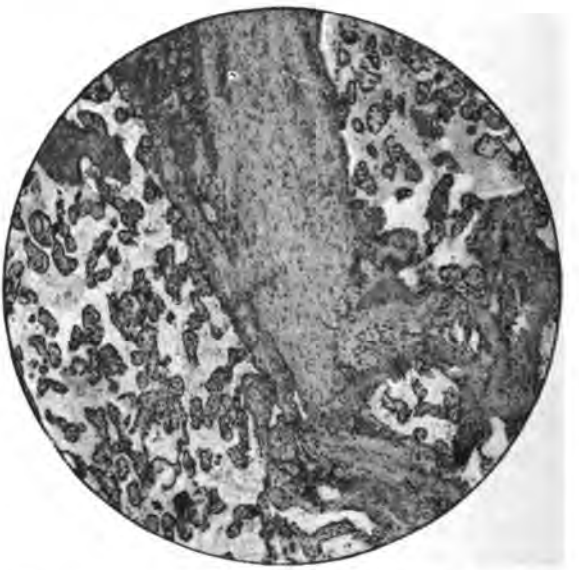


FIG. 4.—ANOTHER SECTION OF THE SAME PLACENTA.

also showed signs of postmaturity; at the same time I could not formulate to myself what I expected these signs to be. The

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placenta, as is well known, begins to show signs of age before the ninth month of intra-uterine life is reached; it is, in a word, senile



FIG. 5.—SECTION OF UMBILICAL CORD FROM THE SAME CASE, SHOWING GREAT THICKENING OF THE WALLS OF ONE OF THE ARTERIES.



FIG. 6.—SECTION OF THE SAME CORD, SHOWING CHANGES IN THE MUCOID TISSUE.

before the infant is born. In this respect it does not differ from the decidua vera and reflexa and the umbilical vesicle, etc. These

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signs of senility ('physiological degeneration') have been described by Eden (*Journal of Pathology*, iv. 265, 1896) and others. Would the changes in a postmature placenta be an exaggeration of these? I found on examining a number of sections that the syncytial covering of the villi was uniformly and markedly thin (Fig. 3). It consisted entirely of a thin layer of plasmodium, and here and there the nuclei of it had run together. Further, there were many patches of fibrous tissue in the placenta, many more than are usually seen, and the vessels had thickened walls (Fig. 4). The decidual tissue, however, did not show degenerative changes to any extent. In the umbilical cord, however, the intima of one of the arteries was so greatly thickened as practically to obliterate the lumen (Fig. 5), while the other artery had also a thicker wall than is normal. The vein, likewise, showed thickening of its wall. Dr. Lovell Gulland kindly looked over some of my sections with me, and concurred with me in my description of them. He further pointed out an additional and interesting fact regarding the cord, the presence of distinct fibres in the mucoid tissue or jelly of Wharton (Fig. 6). This, I take it, must be a sign that even the mucoid tissue of this cord has passed on to a further stage in development than is met with at full term. These changes in the placenta are of such interest that I may possibly take them up at greater length in another article.

Notes.—This case calls for little comment. It is evidently of great importance both as an instance of prolonged retention of the living fœtus in the uterus, and also as an example of anencephalus. It is perhaps unfortunate that the two states were conjoined, as some of the anatomical and histological characters must be ascribed to the malformation, and not to the postmaturity; but to my mind it is not difficult to distinguish these into two groups according as they indicate defective development and excessive development. The placental changes and those in the umbilical cord cannot, I think, be in any way ascribed to the malformation of the cranium of the fœtus.

VI. Miss F.—J. F., an unmarried 1-para, nineteen years of age, was seen by me on January 4, 1902. She was under the care of two of my dispensary pupils, and they reported to me during the morning that her labour was making slow progress. I examined her, and found the os about the size of a crown-piece, the membranes bulging in a natural fashion, and the head (not well flexed) presenting. In the afternoon they reported again, and I saw her about 5 p.m. The membranes had ruptured (not much liquor

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amnii), the anterior fontanelle could be easily felt, and the head seemed to be lying with the forehead to the back and right side. Abdominal examination showed that the fœtal head was large and lying above the brim; the sulcus between the occiput and the neck could be very plainly felt. The fœtal heart was audible. I put on forceps, but failed to bring down the head. After three attempts I came to the conclusion that it was not possible by this means to bring so large and well ossified a head through the pelvis. There was, it ought to be added, a slight degree of general contraction of the mother's pelvis, but no flattening. By this time the fœtus was moribund, so I perforated the head with the basilyst. Unfortunately, I could not reach the vertex or occiput of the head, and so had to make the opening rather far forward in the cranial vault. During the perforation I was struck by the great hardness and thickness of the vault bones, and even when I got the basilyst well through the bones they still resisted its lacerating effects very manifestly. After breaking up the head and washing out the contents, I again tried traction, but after several efforts (in which I was aided by the resident surgeons from the Royal Maternity Hospital), which proved futile, I determined to take the patient into the hospital. A large douche was given, and the vagina plugged with iodoform gauze. The patient was admitted to the Maternity at 7.30 p.m., and Professor Simpson (the senior physician in charge for the quarter) was summoned. He further diminished the size of the head, and attempted with the basilyst to break up the basis cranii also. This latter procedure proved very difficult on account of the position in which the head was lying, but it was ultimately accomplished; then partly with the basilyst tractor and partly with the cranioclast the head was brought on to the perineum, occiput to the front and left, forehead to the back and right. Now again there was delay, and the large shoulders stuck in the pelvis; it was found to be impossible to reach the axillæ. I suggested the performance of cleidotomy, and with Professor Simpson's approval I divided the infant's right clavicle. There was no difficulty in reaching the clavicle, but its advanced state of ossification made its division difficult.* The good effect of this unilateral cleidotomy was immediate, for the posterior axilla immediately came within reach, and the birth of the child was soon completed.

The vagina was frequently douched during the various manipula-

* This was the second occasion on which I had performed cleidotomy. The first time was for a flat pelvis, and the clavicle in this instance was very easily fractured (*Scott. Med. and Surg. Journ.*, viii. 48, 1901).

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tions. A saline infusion was injected under each breast, as there had been a good deal of hæmorrhage, and the uterus and vagina were plugged with iodoform gauze after the uterus also had been douched out. Considering all the circumstances of the case, the patient made a good recovery; the highest temperature recorded was one of 100·6° F.; and she left the hospital on January 22.

The infant, without the brains and cranial vault bones, weighed nearly 8 pounds, and the placenta had a weight of 1 pound 12 ounces. The length of the child (without the cranial vault) was 21 inches. The ossification was everywhere well advanced, and the parts had a mature appearance. Unfortunately, the placenta was not secured for microscopical examination.

That this was a case of postmature labour I have no doubt. The patient, according to her dates, was five weeks past the full term, and the development of the infant was quite in keeping with the idea of postmaturity. It is noteworthy that the menstruation was of the thirty-day type. The patient was in good health during the whole period of her pregnancy. She felt quickening in July, 1901, and, as has been stated, the infant was born on January 4, 1902.

VII. Mrs. G.—The record of this case is imperfect, but I insert it because it illustrates the occurrence of antenatal desquamation of the cuticle in a postmature infant.

On November 23, 1898, I saw, in consultation with Dr. R. A. Lundie, an infant ten days old, which had been born with the epidermis peeling off. The child, a male, was the result of the fourteenth pregnancy of the mother, a perfectly healthy woman. Eight of the children, including the present one, had been boys, and six girls. All had been healthy at birth except the present, but two had died in infancy. The present pregnancy had been uneventful, and the mother stated that she had not been exposed to any infection, and had not known of any cases of scarlet fever or measles in the vicinity. She described the labour as dry, and was quite certain that she was ten days or a fortnight past her time. Dr. Lundie was not present at the moment the infant was born, but he arrived very shortly thereafter. The placenta and membranes did not strike him as in any way abnormal, and he noted that there was some vernix caseosa, but not much, on the skin. The desquamation of the cuticle was going on at birth. The child was torpid and did not cry. It was with difficulty that it was fed, for when the milk was put into the mouth it was almost always shot out again, unless the mother took care to pour it well back into the pharynx.

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When the infant was a week old it was observed that the left parotid gland was somewhat enlarged; it still remained in the same torpid state. It was ten days old when I saw it, and the umbilical cord had not yet separated. The epidermis was still coming away in large flakes, and Dr. Lundie showed me quite a considerable piece which had separated from the sole of the foot. The stools were more highly coloured than usual at this age. The child died a few days later, but, unfortunately, no post-mortem examination was obtained.

These seven cases, representing ten postmature labours, illustrate several of the many ways in which postmaturity may manifest itself in connection with obstetric practice. I shall have occasion to refer to them again and again during the discussion of the general aspects of this problem of the postmature.

Anatomy of the Postmature Infant.

In its anatomy the post-mature fœtus is a baby of one or two months old, with some fœtal peculiarities still in evidence. This is the key to the understanding of its structural characters. Its anatomical features have not yet been studied in sufficient detail and in a large enough number of cases to enable us to picture to ourselves the whole of its anatomy. There are several unworked or little-worked portions, such as the eyes, ears, skin, genital organs, etc., and until we know what are the postmature characters of these structures, we can only speculate upon many matters about which it would be most desirable to have full knowledge.

In *weight and size* the postmature fœtus is nearly always above the average. Excessive weight, unusual length, and large diameters are, in fact, the most reliable criteria of postmaturity; but they are not always present when there is other evidence of postmaturity, and they may be found when there is no evidence of postmaturity at all. The size and weight of the fœtus depend upon so many factors (size and age of the parents, state of fœtal nutrition in pregnancy, etc.) that it is not wise to decide the question of post-maturity from their evidence alone. At the same time, when taken in conjunction with other signs of over-ripeness, they have a considerable value, and their absence is sufficient to throw doubt upon the clinical history of any case of alleged postmaturity.

F. J. Taussig (*American Journ. Obstet.*, xliv. 516, 1901) has collected together sixty-one cases in which there was good evidence that gestation had lasted longer than 300 days; in all these the

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weight was greater than 4,000 grm., and usually much greater. There was, however, one apparent exception, an anencephalic fœtus; it weighed only 3,762 grm. This exception was easily accounted for by the nature of the monstrosity—viz., absence of the cranial vault bones and brain. Of the ten illustrative cases reported by me, three were instances of anencephaly, and the weights of these three were: 3,270, 5,000, and 4,490 grm.; so that even when this monstrous condition is superadded to postmaturity the weight may still be much above the normal in some cases. In Taussig's list are to be found records of fœtuses weighing as much as 6,000, 6,355, 6,370, 7,000, and 7,470 grm.; of the five cited, one was a female. Many of the fœtuses measured more than 55 cm. in length, and three exceeded 60 cm. One reached the extraordinary length of 67·6 cm.

Remarkably large head diameters have also been reported by many observers in cases of postmaturity. I need not load this article with figures, and I simply refer the reader to the case of Mrs. B. for measurements of the head, and to that of Miss E. for those of other parts of the body (trunk, limbs).

The *skin and its appendages* may be expected to show peculiarities in postmaturity, and there is evidence of the following characters: There is absence of the lanugo, and apparently also, in some cases, of the vernix caseosa; desquamation is in full progress (Mrs. G.); there is no redness of the skin, such as is so characteristic of the premature infant, and the nails project well beyond the tips of the digits; there is a plentiful accumulation of subcutaneous adipose tissue, and the scalp is provided with a marked quantity of hair; the flexures at the various joints are deeper than usual.

Ossification is usually far advanced, and in one at least of my cases was exceedingly far advanced. This character is to be noted in practically all the bones of the body. It is very evident in the cranium, where the anterior fontanelle may be reduced to a very small space, the posterior fontanelle be obliterated altogether, and the sutures may be serrated in part at least.

It has been noted by M. Nuñez Rossié (*American Journ. Obstet.*, xix. 18, 1886) that the anterior fontanelle has lost its usual quadrangular shape, and become nearly triangular. The cranial bones are thick, and Rossié noted specially the compact consistence of the inner and outer tables. The whole cranium has, perhaps, a more quadrangular shape than usual, and its enlargement is more marked in the antero-posterior and transverse diameters than in the vertical ones.

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In other bones the ossification is also far advanced. The sternum may show five centres (as in the case of Miss E.), and the whole vertebral column is markedly bony. The ossific nuclei in the lower epiphysis of the femur and in the upper end of the tibia are larger than usual; they may measure 6, 7, 8, and even 9, mm. in diameter. Further, ossific nuclei, which are not usually present at birth, or very feebly marked, may be found in these postmature infants. Instances are met with in the nuclei of the upper and lower epiphyses of the humerus, of the cuboid bone, and of the astragalus. The lower jaw also is well advanced in development, and, as I found when performing cleidotomy, the clavicle may be very osseous.

The *internal organs* exhibit their postmaturity in various ways. The structures which lie in the neck, for instance, instead of occupying the high position which they have in the fœtus, lie at a low level *quâ* the vertebral column; in fact, they have more nearly their adult relations in this respect. The liver, again, does not occupy so much space in the abdomen as it does in the mature or premature fœtus; it also has more nearly its infantile, if not its adult, relations. The lower part of the large intestine is more distended with meconium than is usual in the full-time fœtus, and the bladder may be found full of urine (Mrs. B). The heart has a foramen ovale nearly closed, and a ductus arteriosus, which may apparently be no longer patent. The convolutions and sulci of the brain are better marked than is common at birth. The whole muscular apparatus is further advanced in development. No doubt there are many other anatomical characters, both naked-eye and microscopic, which will be found to be present in the postmature fœtus; but further investigation on this point is urgently needed. It would be specially valuable if we could obtain careful post-mortem examinations of post-mature infants that survived birth for a few hours or days, and then succumbed to some malady not directly due to the post-maturity. In the meantime the characters described above seem to have been well established.

Apparently there have been very few examinations of the *placenta*, *membranes*, *liquor amnii* and *cord* in these postmature labours. In Taussig's list there are three references to the presence of calcareous materials on the surface of the placenta, and this may reasonably be regarded as a sign of maturity (Sfameni, *Annali di Ostetricia e Ginecologia*, xxi. 870, 1899). With regard to the size and weight of the placenta there seems to be sufficient evidence to show that both are increased. In the case of Miss F. the placenta weighed 1 pound 12 ounces, and in that of Miss E. 675 grm., or nearly 1 pound

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8 ounces. At the same time, it is hardly to be expected that the placenta will be much above its normal full-time weight, for I have elsewhere shown ('Manual of Antenatal Pathology,' p. 93, 1902) that there is a marked slackening in the rate of increase of the placenta in the last two monhts of pregnancy. Probably another month spent in the uterus will not add much to the original weight of the after-birth. The histological appearances of the postmature placenta are interesting, but, unfortunately, the number of observations is very small. I do not know of any other than my own in Miss E.'s case, although, doubtless, a careful search through the literature of the subject might disclose others. The changes would seem to consist in the presence of a very thin syncytial layer, with signs of degeneration (fusing of the nuclei) over the villi, in the entire absence of Langhans' layer, in endarteritic changes in the vessels, and in the existence of a notable number of areas of fibrous degeneration. If, then, the most active and essential part of the placenta be the epithelium which covers the chorionic villi, there is reason to believe that the postmature organ is no longer of high physiological importance. This view is supported by the vascular changes in the umbilical cord (one artery almost closed), and by the conversion of some of its mucoid tissue into fibres. I cannot explain the absence of degenerative changes in the decidual part of the placenta, unless, indeed, it be that this want of degeneration was the cause of the longer stay of the fœtus *in utero*. The liquor amnii would appear to be small in amount in most cases of postmaturity, and in some it may have been nearly absent. In the three cases of anencephaly combined with postmaturity to which I have referred, it is noteworthy that in none of them was there excess of liquor amnii, although it is well known that hydramnios is very frequently associated with that type of monstrosity.

Such stated shortly are the facts, so far as they are known, of the anatomical peculiarities of the fœtus and the fœtal annexa that have remained too long in the uterus; such are apparently some of the results of a prolonged intra-uterine existence. Let us now examine the physiological aspect of the matter.

Physiology of the Postmature Infant.

In dealing with the anatomy of the postmature infant, we were considering facts which had been demonstrated even if they are but little known; but when we approach the subject of the physiology of postmaturity we have to confess that we have to do almost

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entirely with speculations. We do not, as a matter of fact, know what functions the fœtus is performing during these accessory or complemental weeks of antenatal life, nor how he is performing them. We can only make certain suggestions and advance certain hypotheses, whose probability will largely depend upon the correctness of the views we hold with regard to fœtal physiology in general.

It is to be expected that in the main the physiology of the postmature fœtus will be a continuation of the physiology of the mature fœtus. The placenta will continue to be the chief fœtal organ, the liquor amnii will continue to diminish in amount relatively to the size of the fœtus, there will be further signs of physiological independence on the part of the fœtal intracorporeal organs (*e.g.*, kidneys, liver, intestines), and the replacement of cartilage by bone in the skeleton will be proceeded with. But there will also be a difference. The physiology of the postmature fœtus will be something slightly (or perhaps markedly) different from that of the fœtus in the last trimester of pregnancy. The senile changes in the placenta will, by interfering with the special metabolism of that organ, call forth a greater amount of independent metabolism in the fœtus; for example, it will act less perfectly as an excretory organ, and so urine will accumulate in the fœtal bladder. Through the absence or diminished quantity of the liquor amnii the desquamation of the epidermis which usually commences after birth will have already begun. On account of the tendency to close shown by the foramen ovale and ductus arteriosus, there will be changes in the circulation which may lead to the awakening of certain organs to physiological activity, and which may thereby endanger intra-uterine life. In this relation, it is a curious fact that F. A. Stahl (*American Journ. Obstet.*, xxxi. 842, 1895), in describing a case of postmature labour, states that *vagitus uterinus* was heard distinctly several times during the operation of version. The fœtal heart-rate also may slacken. The meconium will probably be forced downward in the bowel by active peristalsis till it lie wholly in its lowest part, and may even be expelled before birth into the uterine cavity. There will then be a subtle change in the physiology of the fœtus due to the engrafting upon it of some phenomena which are characteristic of neonatal rather than of antenatal life. I might expand these speculations, but I forbear, because, after all, they are largely hypothetical. At the same time I need hardly point out how important it would be if we could obtain reliable data regarding the histological characters of the blood in the postmature infant, the chemistry of his urine, the state of his

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reflexes and of his nervous activities in general, and the character of his placental interchanges. All these are matters which may be yet investigated, and with much profit. It would be very interesting to know, for instance, the chemical composition of the placenta and fœtal tissues in a case of postmature labour, the amount of iron in the fœtal blood and liver, and the percentage of lime, potash, and soda salts in all the parts.

Pathology of the Postmature Infant.

The chief peculiarity about the pathology of the fœtus which has remained too long in the uterus is the predominance of traumatic morbid states. It has to pass, like any other infant, through the mother's pelvis, and during its transmission it is subject to injuries of various kinds. The larger and the better developed the infant is, the more will it suffer. These intranatal injuries must of necessity mask to a large extent any other peculiarities in the pathology of the postmature infant, and allowance must be made for them, because it is not possible to hope for many opportunities of examining postmature fœtuses which have been removed by Cæsarean section and so been spared the great traumatism of birth. Let us consider first, then, the morbid changes due to intranatal pressure and obstetric interference.

Fractures are common, and are found more particularly in the region of the head. In the case of Mrs. B., for instance, both the frontal and occipital bones were broken. The advanced state of ossification of the cranium predisposes to these solutions of continuity, for displacement of the bones one upon the other and head moulding cannot occur. Another region of the body in which injuries are common is that of the shoulder girdle, for next to the head the shoulders find the greatest difficulty in passing through the mother's pelvis.

Hæmorrhages also are common in postmature infants. H. R. Spencer's monograph on 'Visceral Hæmorrhages in Still-born Children'* is a classic, and gives information of the greatest value relating to these lesions, but, unfortunately, there are no details as to the mature or postmature character of the labours, save the indirect evidence afforded by the weight of the infants. It will probably be found, when numbers of cases of postmaturity have been studied, that the cerebral, hepatic, renal, adrenal, pulmonary, and splenic

* *Trans. Obstet. Soc. Lond.*, xxxiii. 203, 1892.

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hæmorrhages described by Spencer are specially common in them. In Mrs. B.'s case the intracranial hæmorrhages were very extensive; they are well seen in Fig. 1.

In addition to these injuries which result solely from the pressure brought to bear upon the head and other parts of the fœtus by the bones of the mother's pelvis, there are the lesions inflicted by the obstetrician in his efforts to aid labour. There may be skin abrasions and muscular ruptures, fractures of the cranial vault, and injuries of the deep-seated organs from prolonged traction (and compression) by the forceps or blunt hook, not to speak of the actual lacerations and disruptions caused by the operations of craniotomy, basilysis, cranioclasm, cleidotomy, and the like.

Even when the postmature infant escapes an intranatal death, his future health may be seriously interfered with by the results of the traumatism through which he has passed; his later pathological developments will take on a special character therefrom. The obstetrical paralyses, for instance, may be the price that he has to pay for his postmaturity, and other little-understood congenital disabilities may be due to the same cause.

In addition to these morbid states which are directly or indirectly due to the difficulty which an over-ripe fœtus finds in passing through the mother's pelvis, there are others which cannot be thus explained. Just as the anatomy and physiology of the postmature fœtus exhibit peculiarities, so his pathology will be exceptional, and its exceptional character will be in some measure dependent upon these anatomical and physiological deviations. The changes in the structure and functions of the heart and kidneys and placenta and brain can hardly fail to influence the development and manifestations of diseases affecting these organs. Possibly future observations will show that postmature infants are less liable to jaundice of the new-born, to hæmorrhage from the umbilicus, to septic infection, to chilling, etc., than mature or premature children. Our knowledge on this matter is certainly not sufficient to warrant dogmatic assertion.

Finally, it would seem that in the pathology of the postmature fœtus teratological states occur with greater frequency than in that of ordinary infants. This appears to be specially true of anencephalus. Out of the ten cases of postmaturity recorded above, three were anencephalic fœtuses; in Taussig's list of sixty-one cases, three also were anencephalous; and Maidlow has recently reported another (*Lancet*, p. 990, October 11, 1902). Obviously this percentage of anencephaly is far above that met with when all labours (pre-

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mature as well as mature) are included. The discussion of the cause of this association of anencephaly and postmaturity leads me to that of the causation of postmaturity itself.

Pathogenesis of Postmaturity.

The causation of postmature labour is one of the many mysteries which are met with by the student of antenatal physiology and pathology. To clear away the mystery it would be needful to know the cause or causes of the supervention of labour on or about the 276th day after impregnation. This knowledge, notwithstanding much investigation and too much speculation, we do not yet possess. Neither simple periodicity, nor distension of the uterus, nor heredity, nor the 'unconscious memory of the tissues,' will explain it satisfactorily; and, of course, the 'maturity of the ovum,' so much spoken of in a hopeful way as *the* explanation, can scarcely be the cause, else why do postmature labours with postmature fœtuses occur? Some of the causes of premature labour are known, such as rupture of the membranes, dilatation of the cervix, hæmorrhage into the placenta, and the use of oxytocic drugs; but these do not help us much in our explanation of postmature labour, unless, indeed, we simply affirm that its causes are the negations of the above.

Causes have been suggested, and in no small number, but none of them can be called sufficient. Multiparity, for instance, has been affirmed, but three out of my seven patients were primiparæ. The advanced age of the mother has been referred to, and it is true that both my first patient and her husband were elderly; but this was not a noteworthy fact in the other cases. Heredity has been mentioned, as has rest in pregnancy. The type of menstruation has been stated as having an influence upon the length of utero-gestation, and it has been supposed that the thirty-day type would mean a prolonged pregnancy; but the menstrual type would appear to have been rarely other than twenty-eight day. The postmature infant is possibly more often a male than a female, but in my series of cases there were nearly as many females as males. The frequency of anencephaly suggests that in this malformation may lie at least one possible cause of postmaturity, and perhaps the absence of the rounded cranial vault at the brim of the mother's pelvis may in some way lead to non-excitation of some reflex mechanism which normally initiates uterine contraction. It must, however, be confessed that we are really in the dark as to the pathogenesis of postmaturity. Perhaps the secret lies in the placenta, perhaps in the

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maternal nervous system, perhaps in the fœtal metabolism. Who can tell? With some hesitation I suggest that the causation is not single, but multiple, and that the occurrence of delay in the onset of labour pains is due to a defect in the orderly incidence of exciting and determining factors which normally excite them. Whether the chlorate of potash given in Mrs. A.'s case tended to prolong the pregnancy is not a very important question, for in most postmature labours no such medicine has been taken, and in the first and fourth of Mrs. A.'s postmature pregnancies it was not administered.

The meaning of postmaturity is not so difficult to estimate as its pathogenesis. It is not, I think, to be regarded as a mark of high procreative power, or as a sign that the reproductive organs are performing their functions better than usual; it is rather to be looked on as a sign of defective physiology, as an indication of the abnormal in character as well as in time. The fœtus, although large, is not necessarily equally and evenly well developed, as is shown by the occurrence of anencephaly, non-descent of the testicles, etc.; there is often that curious combination of advanced and retarded development to which I have referred. Its association with advanced age of the parents and with the previous history of *premature* births are facts which point toward the conclusion that postmaturity is eminently pathological. Certainly it leads to very morbid types of labour. It is an interesting, although not perhaps an important, fact that the mother in Paget Blake's* case was one of triplets, and that in Maidlow's case the parents were first cousins.

It would be of great interest if the after-history of such postmature infants as survive their birth could be obtained.

Symptomatology of Postmaturity.

It does not appear that the pregnancy of the woman who goes beyond the full term is specially disturbed by dangerous, or even by unpleasant, symptoms. Perhaps there is, as has been stated by W. F. Sprenkel,† a greater risk of renal inadequacy and resulting eclampsia in these cases; perhaps, also, sickness may be more troublesome and fœtal movements more disturbing; but as a general rule the gestation period passes by in comparative peace and comfort, and so contrasts all the more markedly with the stormy scenes and pressing dangers associated with the postmature labour. No doubt the prolonged residence of the fœtus *in utero* produces an

* C. Paget Blake, *Trans. Edinb. Obstet. Soc.*, xviii. 246, 1893.
† W. F. Sprenkel, *American Journ. Obstet.*, xxxiv. 846, 1896.

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effect upon the maternal system, and it would be exceedingly interesting to know just what changes are brought about in the physiology of the mother under such circumstances; but in the absence of knowledge on this point it would be a mistake to speculate. It will be well if future workers in this field of research will make careful analyses of the urine, microscopical examinations of the blood, and investigations of the nervous system (reflexes, sensibility, etc.) of all women who have passed the full term of pregnancy.

Apparently, it is not uncommon for a sort of 'missed labour' to occur about the calculated full term of utero-gestation. Some uterine pains may occur, and the patient may feel sure that her confinement is imminent, and then these may die away and nothing further occur till some weeks later. 'Missed labour,' however, is not a constant occurrence in these cases, and sometimes there is no evidence of uterine contractions till the postmature delivery itself supervenes. At the same time, as soon as the estimated full time is passed, the patient can hardly be described as in a satisfactory state; she is annoyed, vexed, and irritated by the unexpected delay which has thrown all her arrangements out of order; she is to some extent alarmed by the possible consequences which may be looked for when labour does supervene, and her nervous system may, so to say, get the better of her and lead to unpleasant, and even alarming, phenomena. It need hardly be added that the nurse and doctor who have been engaged for the confinement will find it a hard task to be uniformly cheerful and helpful to the patient as week after week passes by with no sign of the arrival of the expected infant. The question whether the medical man under these circumstances ought simply to wait will be considered immediately.

When, ultimately, labour pains do come on, the comparative peace of the pregnancy soon gives way to all the turmoil and anxiety of a tedious, and often instrumental, labour. The medical man also is apt to be taken unawares. He may have carefully measured the mother's pelvis and found it to be normal, and he may have explained the postmaturity away by the thought (expressed or unexpressed in words) that the patient had 'made a mistake in her dates'; so he may come to the confinement little prepared to interfere with forceps, and dreaming not at all of being called upon to perform any of the major operations of obstetrics. He is soon undeceived. He finds the head lying above the pelvic brim, most often badly flexed, and with the anterior * fontanelle or the face presenting; but he does

* The anterior fontanelle, on account of its small size and unusual shape, may be mistaken for the posterior one.

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not yet, perhaps, recognise that there is going to be difficulty. He waits, but the head does not engage; he again measures the diagonal conjugate and explores the pelvis, but finds there no cause of delay; he perhaps discovers that the posterior fontanelle is not within reach, and that the bones of the head are well ossified. He then applies forceps, not yet anticipating any great difficulty, or perchance he turns or tries to turn. There is very little liquor amnii, and he finds neither operation easy. If he has chosen forceps, he experiences difficulty with the application, and more difficulty with the locking of the instrument. He at length, however, gets a grasp, and he pulls, at first gently and then more powerfully, and finally very powerfully. If he is a thoughtful man, he will soon realize that with such a grasp of the head and such an amount of force he is really performing, not a forceps operation, but embryulcia; it will be plain to him that he is really crushing the infant's head, and he may have his suspicions made certainties by feeling that one or several fractures have occurred. On listening over the abdomen with the stethoscope, he hears either a very slow and feeble fœtal heart or none at all. The results of the auscultation determine his further conduct; he puts the ideas of Cæsarean section or symphysiotomy away from him (if he had, indeed, entertained them at all) and proceeds with the perforator or the basilyst to break up the head and extract the child. Even with the help of these operations he may find it difficult to complete the labour; the passage of the shoulders, for instance, may give much trouble. The finer details in his aseptic or antiseptic practice will by this time have been all abandoned; and he will be glad to get the labour over almost on any terms. He will yet, however, have to face the risks of the third stage and post-partum hæmorrhage, and in the future he sees the danger of sepsis looming gloomily. He will require to stitch up a deep laceration of the perineum, and perhaps have to pack the uterus and cervix for lacerations there. And, finally, he has the difficult task of explaining to the husband of his patient how it has come about that so much interference has been necessary, and that the net result is a dead infant, and a mother whose condition may for some days yet be considered as critical.

This is one clinical picture—perhaps the commonest—but it need hardly be added that there may be many variants of it. All kinds of obstetric interference may be called for, from minor manipulations up to the performance of Cæsarean section; all degrees of gravity of prognosis to mother and infant may be met with; and all sorts of emergencies and difficulties may arise. Enough has, however, been said to give the reader a notion of the symptomatology and general

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clinical features of a postmature labour, and to emphasize the importance of this problem of postmaturity.

Management of Postmaturity.

As with the premature, so with the postmature labour: the ideal plan of procedure is *prevention*. Unless it can be shown that the infant benefits in any way from a prolonged residence in the uterus, the logical plan will be to cut short its stay, for assuredly there is no advantage accruing to the mother from such an anomaly. Possibly, cases may occur in which the infant that has lived a month longer in the uterus shows only a state of maturity, and not one of postmaturity. In such instances it may be claimed that the additional month was needed to bring the retarded development of the fœtus up to the normal. These cases, however, must be rare, for it is shown by Taussig's tables that prolonged pregnancy and increased fœtal weight are very frequently, if not always, associated. Again, the microscopic examination of the placenta in Miss E.'s case gave evidence of changes in that organ of a type not likely to help a fœtus to a marked state of development. From the point of view of placental activity, there seems no reason to suppose that an additional month spent *in utero* is of service to the fœtus.

It may be regarded as probable, therefore, that the infant gains no advantage from its postmaturity. We know, as a matter of experience, that it is of the greatest disadvantage to it during the process of birth, and may even be the cause of its death. The prevention of postmaturity, therefore, is to be attempted.

There are several different directions along which preventive measures may be projected.

In the first place, there might be prevention of the tendency towards postmaturity. Alas, however, we do not know the cause or causes of the uterine inactivity, and so we are unable to prevent their influence coming into play. If we knew that the prolongation of pregnancy was due to the advanced age of the parents, to their consanguinity, to maternal emotions, or to any drug or mode of life, we could see some hope of success for this line of treatment in the future; but at present there is no indication of this.

In the second place, there might be prevention of postmaturity in cases in which this anomaly has occurred in a previous pregnancy. It does not seem very likely that anyone will be so bold as to suggest the induction of labour in a primipara who has gone two or three weeks beyond the estimated date of her confinement. Under these

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circumstances the medical man is justified in thinking that probably there has been an error in the calculation of the length of the pregnancy, and he will be wise to await events. At the same time, he will do well to test the urine frequently for albumen, and to examine the abdomen of the mother now and again to discover the lie of the fœtus, the depressibility of its head into the pelvic brim, and its flexed or extended condition. Measurements by means of the cephalometer (Budin's or Perret's), although possibly difficult to obtain, would be of great service in enabling the medical attendant to estimate whether the fœtus is postmature or not. It need not be added that the rate and character of the fœtal heart-beats should be watched. It is quite possible that the results of these investigations might justify us in bringing on labour even in a primipara.

Whatever may be the view we take of our duty in regard to the primipara who has gone undelivered beyond the full term, there can be little doubt as to the line of conduct to be followed when a woman who has once had a postmature labour of a dangerous kind shows signs of repeating the experience. Under such circumstances there seems no reason why a dose of castor-oil might not be given about the estimated date of delivery, and followed up with 10 grains of quinine the next morning, as recommended by Barton Cooke Hirst ('Text-Book of Obstetrics,' 2nd edit., p. 288, 1900). Consultation with another medical man is, however, a useful preliminary to these and to the more active and instrumental attempts to bring on labour.

If it were deemed inadvisable to induce labour in any case in which the full term is past, the resources of preventive obstetric medicine are not exhausted. There is still the possibility of checking the growth of the fœtus by altering the diet of the mother. It is true that we know little about the influences which regulate fœtal growth and ossification, but of late years Prochownick (*Centralbl. f. Gynäk.*, xiii. 577, 1889; *Therap. Monatsch.*, xv., Hft. 8, 9, 1901) and others have boldly attacked the problem, and have accumulated evidence which proves, as clearly as purely clinical evidence can prove, that a certain diet tends to produce small infants with comparatively soft heads. I have elsewhere ('Manual of Antental Pathology,' p. 473) considered this matter pretty fully, and I need not write more upon it here. The diet recommended by Prochownick is one which contains very little fluid (not more than 500 c.c. in the day), and no soups, potatoes, puddings, sugar, and beer. By this method of feeding, while it could not be hoped that the postmature pregnancy could be brought to an end, it might, at least, be expected that the infant's size and development would not be so

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large, and that in consequence its transition through the pelvis would not be so traumatic.

In the next place, there is the actual *management of a postmature labour in progress*. The time for prevention has gone by, or the obstetrician has been summoned only after labour has been in progress for some time. The first step in the treatment now is an early recognition of the state of affairs, and a clear conception of the dangers that it carries with it. The obstetrician must realize that he is actually face to face with the same sort of difficulties and dangers as are met with in a case of labour in a contracted pelvis. It is as difficult for a large head to get through a normal pelvis as it is for a normal-sized head to get through a small pelvis; and if the large head be also a strongly ossified one, it may be more difficult. When, therefore, the medical man is called to a case which has gone a fortnight, or a month, or more, past the full term, he ought to try to ascertain the size and degree of ossification of the head and its relation to the mother's pelvis. He ought first to make careful measurements of the diagonal and external conjugate diameters as well as of the interspinous and intercristal, and so deduce the length of the conjugata vera and of the transverse at the brim (*vide* Sandstein's article in this JOURNAL, p. 356, October, 1902), so as to exclude a pelvic contraction. Of course, maternal pelvic deformity and a postmature labour may be met with in the same patient; all the difficulties are then increased and the danger intensified. Having found that the mother's pelvis is normal, the obstetrician ought next to try to measure the occipito-frontal diameter of the fœtal head through the abdominal walls with the cephalometer in the manner described by Perret (*l'Obstétrique*, iv. 542, 1899); this will give him an idea of the size of the head. Then he ought to note how the head is lying, whether the occiput and the groove of the neck are easily palpable (indicating extension) or not, and whether or not he can depress the head into the brim of the pelvis. From this examination he will be better able to forecast the probable progress of events, and it is of the greatest importance in these cases to recognise early what amount and what kind of obstetric interference will be required. The vaginal examination, after the os has dilated, may aid in making clear the position of the head and its degree of flexion or extension. It ought to be borne in mind that in a well-ossified head the anterior fontanelle may not greatly differ in its characters from the posterior fontanelle of a poorly-ossified one.

The further management of the case will depend largely upon the results of these examinations. It may be judged that it is pos-

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sible for the head to pass through by means of the natural efforts alone or with the help of the forceps, and, of course, such cases are not uncommon. The obstetrician then simply waits events, or applies forceps in the second stage. There may be a delay which is due solely to the oligohydramnion; this may be counteracted in part by vaginal douching. But there may be cases, however, in which the application of forceps is not sufficient easily to complete the confinement; these are the instances which the obstetrician requires most carefully to watch for. Too often the attempts with forceps are persisted in till the operation becomes really one of head-crushing, and the result is a still-born child; or recourse has to be had to actual head perforation.

What, then, is the obstetrician to do when he finds that he cannot extract a living and postmature child through the mother's pelvis? Is he to do symphysiotomy, or Cæsarean section, or craniotomy? What he does will probably depend in part upon the view he takes regarding the justifiability of craniotomy in any case; it will also depend upon the state of the infant (whether it be alive, dead, or in danger of dying, as ascertained by the state of the fœtal heart-beats). In the great majority of cases, however, he will still decide in favour of craniotomy; but it is quite likely that in five or ten years the operation of choice will be Cæsarean section. Here we are dealing, not with a premature, but with a postmature infant—with, in other words, a thoroughly viable infant, and one which ought to live if it were once safely extracted from the mother's uterus. It is not likely to succumb after birth, so far as is known, unless it has been injured in the birth. Congenital debility is hardly to be feared. There is, therefore, much to be said in favour of Cæsarean section in these cases; only if it is to have a fair chance of success it ought to be performed early in labour, and not after repeated futile attempts have been made with forceps. Herein lies another reason for the early recognition of the existence of disproportion between the fœtal head and the maternal pelvis. There is, of course, the risk that the infant may be anencephalic; but this can hardly seriously alter the state of affairs, for it will probably be recognisable by the end of the first stage of labour, and before Cæsarean section is embarked upon. If craniotomy is, after all, the operation chosen, it ought to be borne in mind that it will probably be necessary to do cleidotomy and episiotomy in addition, for there is sometimes as great difficulty with the passage of the shoulders as with that of the head, and the perineum almost always tears, and tears deeply. It is unnecessary, perhaps, to emphasize the need for

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surgical cleanliness in the conduct of these cases, although they are just the cases in which it breaks down, and in which there is maternal morbidity, if not actual mortality, therefrom in the puerperium.

The management of the postmature infant that survives his birth cannot be said to be well understood. Obviously the incubator and the wet-nurse that are called for in the case of the premature baby are not needed here. Enough is not known of the physiology of this kind of neonatal life to enable us to lay down rules for the diet and hygiene of the postmature infant. He may be less susceptible to sepsis, his cord may take longer to fall off, etc., but actual knowledge of facts is small. The supervention of œdema neonatorum in one of my cases (Mrs. A.'s second labour) may have been a coincidence. About one thing, however, we can be quite sure. The chief treatment the infant will require should be directed towards the undoing of the evil effects of birth traumatism (cranial fractures, hæmorrhages, lacerations of muscles, etc.); unfortunately, our resources in this direction are not great.

From what has been said, it will be apparent to the reader that the problem of postmaturity has many aspects—some scientific, others unscientific, some theoretical, others intensely practical: all of them, however, have this in common, that they appeal to the obstetrician for solution. If not much has been accomplished in this paper towards the solution of any one of them, it can at least be claimed that they have been fairly stated, and perhaps brought thus more prominently before the notice of those who may be able to solve them.

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