FOETAL POST-MATURITY AND PROLONGATION OF PREGNANCY

A CRITICAL STUDY OF THE INCIDENCE AND SEQUELAE OF INDUCTION OF LABOUR FOR POST-MATURITY IN BRITISH HOSPITALS, WITH REMARKS THEREON

BY

**F. J. BROWNE, M.D., D.Sc., F.R.C.S.Ed.
F.R.C.O.G.**

Emeritus Professor of Obstetrics and Gynaecology, University of London; Consulting Obstetric Surgeon, University College Hospital, London

In 1922 W. J. Ballantyne and I published a paper entitled "The Problems of Foetal Post-maturity and Prolongation of Pregnancy." The opinions expressed were founded largely on the experience gained by the performance up to that time by one of us (F. J. B.) of over 500 post-mortem examinations of stillbirths and neonatal deaths. We emphasized the absence of any reliable criteria, clinical or pathological, for the diagnosis of post-maturity in the foetus or newborn child, but among our conclusions were the following: (1) the dangers to both mother and child are undoubted: they are chiefly associated with difficulty in the passage of the child; and (2) the treatment is prevention of post-maturity by induction of labour at or soon after the carefully calculated period of full-time gestation.

At that time induction of labour was the method of treating disproportion in Britain, and it was because of the fear of disproportion and difficult labour that we advocated it.

In this paper, which represents a somewhat new approach to the problem, the incidence and sequelae of induction of labour for post-maturity, as revealed in all the hospital annual clinical reports available to me—namely, 32 reports from 20 hospitals—are reviewed.

Incidence of Induction of Labour

Table I shows most of the essential details, and it will be observed that, with one or two exceptions, all the reports are of recent date. Each hospital is designated by a capital letter, and where a number is attached to a letter (for example, A1), it indicates reports of succeeding years from the same hospital.

Only inductions done after the 40th week are included and those in which there are no additional indications for induction, such as toxæmia, disproportion, and so on. Caesarean section rates for all the hospital deliveries are included because a high rate might sometimes compensate for a low induction rate.

It will be evident that there are wide differences in the incidence of induction for post-maturity. In hospital K during the year from July 1, 1949, to June 30, 1950, it was not done once in 4,949 deliveries, whereas in hospitals L and O it was done in 3%, and in hospitals G and A4 in 2.7% and 2.1% respectively. In hospital K, in which there were no inductions for post-maturity, the stillbirth rate was the seventh lowest in the series, and in hospital R, in which induction was done very seldom (0.11%) the stillbirth rate was the third lowest. In neither of these hospitals was caesarean section done for post-maturity. Examination of the stillbirth records of hospital K shows that no stillbirths resulted in women who had gone beyond 40 weeks' gestation, so that no babies were lost through failure to induce. The caesarean section rate in this hospital was 1.8%, the lowest in the entire series.

It will be noted that some hospitals with a low induction rate for post-maturity had a very high perinatal mortality rate. This, however, seems to be due to other causes. Thus in hospital F, with 2,641 deliveries and no inductions for post-maturity, 75% of the patients were "non-white," and

TABLE I.—Essential Details of 596 Surgical Inductions of Labour for Post-maturity from 32 Annual Reports of 20 Hospitals

Hospital	Year	Total Deliveries	No. of Inductions for Post-maturity (Over 40 Weeks)	No. of Primigravidae Induced	Percentage of Inductions for Post-maturity	Stillbirths %	N.N.D. %	P.N.M. %	Caesarean Section Incidence in All Deliveries
A	1947	1,320	4	3	0.3	2.6	1.6	4.2	4.2
A1	1948	1,257	7	5	0.5	2.7	1.3	4.0	3.9
A2	1949	1,315	15	13	1.1	1.6	1.7	3.3	3.8
A3	1950	1,270	17	7	1.3	0.9	1.7	2.6	5.5
A4	1951	1,285	27	11	2.1	2.3	0.9	3.2	5.4
B	1950	1,131	9	1	0.8	2.0	0.6	2.6	1.8
B1	1951	1,085	3	3	0.27	2.8	1.2	4.1	2.5
B2	1952	906	3	0	0.33	1.7	1.7	3.4	2.3
B3	1953	1,099	10	3	0.9	2.2	1.4	3.6	3.4
C	1951	3,300	12	7	0.3	2.3	1.7	4.0	3.5
C1	1952	3,446	33	15	0.95	2.1	1.2	3.3	3.2
D	1951	6,418	29	5	0.45	2.3	1.8	4.1	3.4
D1	1952	6,802	34	4	0.5	2.2	1.6	3.8	2.6
D2	1954	6,838	33	7	0.48	1.8	1.3	3.1	3.6
E	1949	1,353	14	2	1.03	2.1	0.4	2.5	2.8
E1	1950	3,347	63	20	1.8	2.8	1.4	4.2	2.2
F	1949	2,641	0	0	0	5.0	2.3	7.3	1.9
F1	1954	2,775	2	2	0.07	3.3	1.4	4.7	5.9
G	1950	3,363	91	2	2.7	2.3	1.4	3.7	3.1
H	1946-50	3,930	67	2	1.7	2.8	1.6	4.4	3.6
I	1951	1,858	20	0	1.0	2.25	1.7	3.95	5.5
J	1953	3,185	6	2	0.2	1.9	0.8	2.7	2.1
K	1949-50	4,949	0	0	0	1.8	1.5	3.3	1.8
L	1954	808	25	?	3.0	3.8	2.5	6.3	5.8
M	1954	1,417	1	0	0.07	4.6	2.7	7.3	2.18
N	1954	1,932	2	1	0.10	5.8	2.6	8.4	5.4
O	1954	1,027	31	7	3.0	1.4	1.7	3.1	4.3
P	1954	562	1	0	0.2	7.5	7.2	14.7	16.7
Q	1954-5	1,577	2	?	0.12	1.7	1.5	3.2	
R	1955-6	2,594	3	1	0.11	1.6	1.4	3.0	
S	1955-6	1,391	11	6	0.8	2.23	1.86	4.19	
T	1955	1,202	21	?	1.7	1.16	1.25	2.41	2.0

N.N.D. = Neonatal deaths. P.N.M. = Perinatal mortality.

the average antenatal attendance was 3.6 per patient. Of the 96 stillbirths, approximately half were emergencies, and only seven had exceeded 42 weeks' gestation, estimated from the first day of the last period. Particulars of these are as follows.

Case 1.—Emergency, 48 weeks; had been in labour five days with membranes ruptured 48 hours; transverse lie; internal podalic version; breech extraction; ruptured uterus; dead birth.

Case 2.—43 weeks; concealed accidental haemorrhage; weight 8 lb. 4 oz. (3,740 g.); dead born.

Case 3.—44 weeks; spontaneous delivery; foetal heart not heard; dead born: 5 lb. 5 oz. (2,420 g.). No post-mortem examination.

Case 4.—47 weeks; toxæmia; inertia; difficult instrumental delivery; 9 lb. 5 oz. (4,220 g.).

Case 5.—Emergency, 43 weeks; diabetic; arrested shoulders; 9 lb. 3 oz. (4,170 g.).

Case 6.—Emergency, 43 weeks; hysterectomy for intrauterine sepsis; weight of baby unknown.

Case 7.—43 weeks; deep transverse arrest; "failed forceps"; internal podalic version; breech extraction; dead born; 7 lb. 3 oz. (3,260 g.).

Apart from associated conditions, such as disproportion, concealed haemorrhage, diabetes, in only one of these seven (Case 3) could it be said that the foetal death might have been due to post-maturity, but as no post-mortem examination was done the particulars are not sufficient to justify a decision either way.

Hospital N had 2,043 women admitted to its wards in 1954, and of these 1,354 were "coloured" and 689 "natives"; 466 received antisyphilitic treatment, and the average number of attendances at the antenatal clinics was only 3.2 per patient. In hospital P with only one induction for post-maturity, the perinatal mortality was 14.7%. The maternal death rate was 11.7 per 1,000 births, and the average antenatal attendance was only 2.5 per patient.

Though the proportion of white and non-white patients in this hospital is not stated, it is notable that all the seven maternal deaths occurred in "coloured" women. None of the stillbirths were over 40 weeks, and therefore none would have been saved by induction. In hospital M, with only one induction for post-maturity, though again the proportions of white and non-white patients are not stated, all three maternal deaths occurred in non-white women, including two Bantus. The antenatal attendances averaged 4.5 per patient, and none of the stillbirths were over 40 weeks.

It is well known that stillbirth rates are much higher among "non-white" women. Edith Potter (1954) states that in 1950 the perinatal mortality in the United States was 66.7 per 1,000 births amongst non-white women and 39.7 per 1,000 among whites.

It will be evident, therefore, that there is no reason to believe that the high foetal and neonatal mortality in these three hospitals was due to their low induction rates. In fact, all the evidence is against it. Further, in hospital L, where the induction rate for post-maturity was 3%, and the highest in the series, the perinatal mortality was 6.3%—the fifth highest in the 32 reports.

Parity.—Clifford (1954) writes as follows: "In general, post-maturity constitutes no obstetric problem to the multiparous woman. In these women, although the incidence of postmaturity [defined by him as over 300 days from the first day of the last period] is 5%, the foetal and neonatal mortality is no higher than in the full-time infants." Yet in the present series, out of 384 inductions for post-maturity in which parity is stated, 261 (68.0%) were done in multiparae.

Sequelae

Induction-Delivery Interval.—In 24 cases this was over two days. Individual durations in these were as follows (in days): 19, 10, 7 (2 cases), 6, 5 (3 cases), 4½, 4 (5 cases), 3½ (2 cases), 3 (3 cases), 2½ (3 cases) 2½ (2 cases). In many cases the interval was shortened by caesarean section. The time elapsing between artificial rupture of the membranes and the onset of labour is not recorded in any of the reports, most of which were compiled in compliance with the directions for a standard report issued by the Royal College of Obstetricians and Gynaecologists, London, which does not require this particular detail. There can be no doubt, however, that the interval was often long, and that this can be dangerous to the foetus is well known. Gibson (1952), in a review of 843 surgical inductions in Belfast, done during 1946–50, found that intrauterine death occurred in 25% of the cases in which the latent interval exceeded 72 hours after artificial rupture of the membranes, probably from anoxia caused by excessive retraction of the uterus.

Caesarean Section.—In induced cases the caesarean section rate was 6.2%. This may not seem unduly high, but it should be remembered that none of the women who were subjected to it had any abnormality except that they had passed their expected date of delivery, because inductions for post-maturity in which there was an additional indication for termination of pregnancy have been excluded. Some of the caesarean sections, too, were done on young primigravidae, and not infrequently resulted in the birth of a quite small baby. Examples of this are:

1. Primigravida aged 23, supposed to be at the 45th week; induction-delivery interval not stated. Caesarean section for foetal distress; baby weighed 5 lb. 10 oz. (2,550 g.).
2. Primigravida aged 21, 41 weeks. Lower-segment caesarean section; weight 6 lb. 2 oz. (2,780 g.).
3. Primigravida aged 21, 42 weeks. Prolapsed cord, L.S.C.S.; weight 5 lb. 9 oz. (2,525 g.).
4. 1-para aged 22, 42 weeks; L.S.C.S.; weight 6½ lb. (2,950 g.).

The usual indication for caesarean section was uterine inertia or disordered uterine action, causing prolongation of the first stage of labour and foetal distress. The average weight of the babies born by caesarean section was 7½ lb. (3,400 g.), but ranged from 5 lb. 9 oz. to 10 lb. 2 oz. (2,525 to 4,590 g.).

Stillbirths.—There were 10 stillbirths, including 1 craniotomy.

Other Complications.—There were two cases of constriction ring, one of prolapsed cord, three of genital tract infection, including one case of hyperpyrexia in the first stage of labour, and one maternal death.

This patient, aged 42, had had four full-time confinements without any abnormality. The first day of her last period was stated to be April 18, 1955. She was seen 13 times in the antenatal clinic, when her blood pressure and urine were always found to be normal. External version was done for a breech presentation at 32 weeks. Vaginal examination at 40 weeks revealed an "unripe" cervix. Surgical induction, by stripping the membranes, was done at 10 a.m. on February 22, 1956, for "prolonged gestation," 44 weeks and 2 days having elapsed since the first day of her last period. The cervix was rigid, and while dilating it with the finger a slight tear was caused in it. The foetal head was then at the level of the ischial spines, and the patient's condition was good and the foetal heart sounds were regular and clear. Labour began 24 hours after induction and proceeded normally until 29½ hours after induction, when, at four fingerbreadths dilatation, she complained of severe pain in the left side of the chest, became cyanosed, with stertorous breathing, and died in 10 minutes—that is, at 3.25 p.m. on February 23. Post-mortem caesarean section was done, but the baby was dead. It weighed 7 lb. 5 oz. (3,345 g.).

At post-mortem examination of the mother no naked-eye abnormality was found. The following was the report on the microscopical examination: "In some of the small veins are linear refractile pink-staining structures and occasional basophilic amorphous masses. The significance of these is uncertain, but they may be amniotic emboli. The rest of the parenchyma is normal. Similar amorphous material is present in some small blood vessels of the kidneys, suprarenals, and ovaries." The provisional diagnosis of the cause of death was "amniotic embolism." Whether or not the induction contributed in any degree to the death it is not possible to say. The case is simply recorded.

Discussion

Perusal of the recent literature reveals considerable divergence of opinion on the importance of post-maturity as a cause of foetal and neonatal death, and indeed on the question whether it is a clinical entity at all. In the United States of America, D'Esopo and Marchetti (1942) reviewed 1,000 consecutive foetal deaths occurring in the six years 1935–40 at the New York Lying-in Hospital, and the Sloane Hospital for Women, New York, and do not mention post-maturity as a cause. Necropsies were done on 89%. Potter and Adair (1943), in a "clinico-pathological study of perinatal mortality" in the Chicago Lying-in Hospital during the 10 years 1931–41, in which there were 27,321 births, did not list post-maturity as a cause of death. During the two years 1954 and 1955 there were in the Chicago Lying-in Hospital 6,593 births. The stillbirth rate was 1.5% and the perinatal mortality 2.7%, both of which included all foetuses and infants weighing 400 g. and over. The total two-year perinatal mortality over 2,500 g. was 1%. Dr. Potter, in sending me these figures in 1956, wrote as follows: "I have never found any evidence in our own material that post-maturity contributed to any death. Many years ago we used to deliver occasional babies for supposed post-maturity, but in several years we have had no caesarean sections or inductions performed for that indication. In fact, I have a strong feeling that one of the reasons for our reduction in mortality has been related to the decrease in induction."

Clifford (1954), the well-known Boston paediatrician, on the other hand, believes that it is an important cause of both foetal and neonatal deaths, but only in primigravidae. He states that 1 in 10 post-mature primigravidae (over 300 days) loses her baby, and that of primigravidae over 26 years old 1 in 3 who became post-mature will do so either before or after birth. In multiparae he finds that post-maturity is in

general unimportant, neither the foetal nor the neonatal mortality being any higher than in mature infants.

Among British writers there is a similar though much less sharp difference of opinion. Latto (1951), in 4,653 deliveries in Oxford, found 171 post-matures—that is, 42 weeks or more since the first day of the last period. Among these there were nine stillbirths, and of these only one could, in his opinion, be attributed to post-maturity. In this case the baby was born 15 days after the expected date and weighed 4 lb. 2 oz. (1,900 g.). The placenta was small and infarcted, and weighed 318 g. Latto blamed post-maturity and a small placenta for the stillbirth.

Gladys Hill (1952) (London) reviewed 115 cases of post-maturity (16 days or more over the expected date). She states: "The findings suggest that post-maturity *per se* does not affect adversely the mother, her labour, or her infant." McKiddie (1949) (Aberdeen, Scotland) found that foetal distress in labour occurred twice as often in post-mature cases as in those that were merely mature, but failed to find any correlation between its incidence and the degree of post-maturity. Neither was there any significant difference between the neonatal death rates in post-mature infants and those at term.

Opinion in Britain and elsewhere has been much influenced by the work of Walker and his colleagues (Walker and Turnbull 1953, 1955; Turnbull and Walker, 1955) in Aberdeen; they found that the stillbirth rate increased significantly after the 41st week. Walker put this down to anoxia, as he found that the oxygen supply of the foetus even in a clinically normal pregnancy falls gradually up to the 40th week and rapidly thereafter. At 43 weeks all foetuses have a low oxygen supply, and practically no reserve to meet the stress of labour. The rise in the death rate after the 40th and 41st weeks is due primarily, he says, to a rising incidence of "unexplained deaths"—that is, death *in utero* when there is no clinical abnormality of pregnancy or labour to explain it. Walker (1954) says: "Deaths of this type are common at 40 to 41 weeks, but by 43 weeks, in primigravidae and multigravidae, they are the highest single cause of death . . . by the 42nd and subsequent weeks at least one-third of all deaths are unexplained."

Rathbun (1943), of Boston, however, did not find any higher incidence of unexplained foetal deaths in post-mature cases either before or during labour (Table II).

TABLE II.—Incidence of Unexplained Deaths in Mature and Post-mature Cases Before and During Labour (After Rathbun, 1943)

	Mature		Post-mature	
	No.	%	No.	%
Deaths before labour:				
No cause	12	16.0	5	18.5
Cause apparent	7	9.3	5	18.5
Deaths during labour:				
No cause	7	9.3	3	11.1
Cause apparent	49	65.6	14	51.9

"However," he writes, "failure to appreciate the fact that labour may be more difficult may cost the baby its life, or even the mother hers." Rathbun concludes: "It would seem that post-mature infants are no more inclined to die for no apparent reason than term infants."

Clayton (1953) stressed the frequency of unexplained intrauterine death before the onset of labour when there is no question of post-maturity, and says it is seen nearly as often before the 42nd week as after it.

Even if we assume that there is a higher incidence of unexplained deaths during labour in post-mature cases, it would seem that as they are due to anoxia there may be another explanation of their occurrence than mere post-maturity—namely, the greater size of post-mature babies and consequent longer and more difficult labours. Rathbun found that the mean weight of mature babies of primiparae was 7 lb. 3 oz. (3,260 g.), and of multiparae 7 lb. 10 oz.

(3,460 g.). In post-matures the corresponding figures were 7 lb. 12 oz. and 8 lb. 4 oz. (3,515 and 3,740 g.).

Cope (1956) found that the average birth weight of 1,000 post-mature infants was 8 lb. 2 oz. (3,685 g.), whilst a sample of 200 merely mature infants (confined between the 273rd and 287th days) had an average birth weight of 7 lb. 8 oz. (3,400 g.). These figures are statistically significant.

Karn *et al.* (1951) found that the mean weight of the first-born males at 280 days was 7 lb. 2 oz. (3,230 g.), and increased to 7 lb. 12 oz. (3,515 g.) at 310 days. The mean weight of first-born females was 7 lb. (3,175 g.) at 282 days and 7 lb. 10 oz. (3,460 g.) at 316 days.

Rathbun also found that labour was longer in post-mature women. At term the average duration was 14.9 hours in primiparae and 8.8 hours in multiparae. In post-matures the corresponding times were 18.2 and 10.5 hours.

Walker (1954) found that the incidence of difficult labour in primigravidae rises steadily from the 37th to the 44th week. At the 40th week only 3.1% of all cases have a major degree of difficulty in labour or delivery, but by the 44th week the figure rises to 13.7%. This rise is, he says, "due mainly to an increase in uterine dysfunction of severe degree, but mechanical difficulty also increases, and is made clinically more important by the less efficient contractions." Clifford, Reid, and Worcester (1951) found that the average duration of labour in primigravidae whose babies were alive at the start of labour and yet were stillborn was 34 hours. The average duration of labour in primigravidae whose infants survived was 17 hours.

In passing it may be remarked that this continued growth of the foetus when pregnancy is prolonged after 42 weeks, which must be due to the passage of nutrient materials in solution across the placenta from the maternal to the foetal circulation, is difficult to reconcile with placental insufficiency and its inability to allow the passage of oxygen. It will be recalled that no greater degenerative changes have ever been found in post-mature than in mature placentas (Reynolds, 1937-8; Masters and Clayton, 1940).

As for the occurrence of unexplained intrauterine death before the onset of labour, it is well known to occur not infrequently when there is no question of post-maturity. In 14 of the hospital reports previously cited, I have found 72 unexplained intrauterine deaths before the start of labour, all under 40 weeks' gestation. In 60 of these post-mortem examinations had been done and the cause of death was usually put down as "asphyxia." Of the 72 deaths, 1 was at 28 weeks, 1 at 29 weeks, 5 at 30 weeks, 1 at 31 weeks, 4 at 32 weeks, 6 at 33 weeks, 7 at 34 weeks, 7 at 35 weeks, 7 at 36 weeks, 6 at 37 weeks, 18 at 38 weeks, and 9 at 39 weeks. Possibly they can be explained by the observations of Robinson (1921), professor of anatomy in the University of Edinburgh, who showed that in ferrets, on which his observations were made, a certain percentage of deaths are "normal" and are to be expected. They are not due to environment, or to any abnormality in the mother during pregnancy, because two or three foetuses in a uterine horn may survive and one die. Robinson concluded that the fault lay in the ovum or sperm or both, and that the embryo or foetus died because it was inherently unfitted to survive beyond a certain intrauterine age.

Compensatory Mechanisms in Anoxia

Accepting the findings of Walker and his colleagues that there is a gradual decrease in the oxygen passing from the maternal to the foetal blood, consideration must be given to certain compensatory mechanisms that nature develops to mitigate its harmful consequences to the foetus. These are at least five: (1) The foetal red blood cells and haemoglobin increase in proportion to the fall in the oxygen supply. If the pregnancy is prolonged beyond 40 weeks, foetal haemoglobin still continues to rise (Walker and Turnbull, 1953). (2) The nature of most of the foetal haemoglobin is different from that of the mother; it has a higher affinity for oxygen and so can take up oxygen more easily from the maternal

blood (Barcroft, 1946b). (3) Anoxia increases the amount of carbon dioxide produced by the foetal tissues, and this by raising the acidity of the blood automatically favours the dissociation of oxygen from haemoglobin and its transfer to the foetal organs, the increase in dissociation being in direct proportion to the partial pressure of carbon dioxide in the blood (Fulton, 1955). (4) The foetal arterial blood pressure rises (Barcroft, 1946a). (5) The foetus seems to have greater tolerance of oxygen lack than has the adult. There is evidence that this is due to a partial anaerobic metabolism which requires less oxygen per unit of energy, and that it persists for some time after birth. Its persistence probably accounts for the fact that, whereas the adult animal cannot stand deprivation of oxygen for more than three minutes newborn animals can survive it for times varying from seven minutes (guinea-pigs) to 50 minutes (rats). Many isolated observations suggest that a similar immunity to oxygen lack exists in the newborn infant (Wilson *et al.*, 1948).

That these compensatory mechanisms are often effective even if the stay of the foetus is prolonged long after 43 weeks is shown by the observation that in all the cases of post-maturity allowed in the English courts not one baby was born dead. A well-known example is that of Gaskill v. Gaskill in 1919, in which the baby was born 331 days after the last cohabitation. Adding 14 days—the usual time elapsing between the first day of the last menstrual period and ovulation—the length of gestation, counting from the first day of the last period, was 49 weeks and 2 days. The baby was not weighed at birth, but was said to be unusually large, and labour was prolonged. It was alive and well. A more recent case was that of Wood v. Wood (1947), in which 346 days had elapsed from the date of the last cohabitation. Adding 14 days, we get 51 weeks and 3 days since the first day of the last period. Again the baby was born alive and well.

It is no answer to these examples to say that the decisions of the courts were at fault. Any woman whose character and conduct can withstand scrutiny and cross-examination in, in each case, three of the highest English courts of law must indeed be without reproach.

It is interesting to reflect that if these two women had been cared for in almost any of the hospitals listed in Table I, labour would have been induced at the 41st or 42nd week and no action for divorce would have been brought on account of the unusual prolongation of pregnancy.

Normal Duration of Pregnancy

After deducting all cases in which the date of the beginning of the last menstrual period was doubtful, or whose gestation period counting from that day was greater than 313 days or less than 251 days, Sutton (1945) found that in 2,293 women the average length of gestation was 283 days, and this was the day on which the greatest number of babies were born. Only 5%, however, were born on that day. The term "average" or "mean" implies a "scatter" on either side of the mean. An important question is, "How large can that scatter be before a birth occurring on a day within it becomes premature or post-mature?"

The standard deviation in Sutton's cases is ± 9.3 days (the 10th day), and only 64% of the births took place between the 273rd and the 293rd day, and 36% took place outside these limits. We must certainly, therefore, regard at least these two days as within the normal range. Thus a baby born on the 273rd day is not necessarily premature, nor one born on the 293rd day necessarily post-mature.

These data show that there may be quite considerable variations in different individuals in the length of time that the foetus and placenta (for the placenta is part of the foetus and should therefore mature at the same rate) take to reach maturity. This suggests the possibility, to put it no stronger, that cases of so-called post-maturity are really instances of slow maturation. This conception would explain the well known fact that there are no reliable criteria, clinical or anatomical, of post-maturity in foetus or placenta. Even by x-ray examination of the centres of ossification before or after birth, or actual measurement of the ossific centres at

post-mortem examination, it is impossible to tell the foetal age within one month (Ballantyne and Browne, 1922).

All young women do not reach maturity and puberty at the same age. Clow (1927), in an English public school for girls, found that in 2,600 girls the most usual age of puberty was 13 years (in 34% of cases). The age of onset of menstruation was, however, 16 years in 14.41%, 17 years in 0.35%, and 18 years in 0.17%. Yet all were healthy girls. She concluded that it is not justifiable to regard a case as one of primary amenorrhoea, or to attempt to interfere with the natural course of events, so long as growth in weight and height continue. The Medical Women's Federation of Great Britain (1933) found that in 1,000 women the age of onset of menstruation varied from 9 to 21 years. In approximately 13% menstruation began after 17 years.

Seeing that there are such variations in the length of time taken to reach maturity in healthy girls, why should we expect it to be otherwise in the unborn child? Just as girls may continue to grow until menstruation starts, so we would expect the foetus to continue to grow *in utero*.

Fallacies in Menstrual Data

It is a commonplace that in the inquiry into a case of possible post-maturity a careful scrutiny of the menstrual history is essential, and especially of the possibility that conception may have occurred in a very long menstrual cycle. While the average length of the cycle is 28 days considerable variations from this mean are common. Gunn, Jenkin, and Gunn (1937), in an investigation of menstrual periodicity, found that in 209 apparently healthy women whose menstrual records were reliable the length of the cycle varied by more than 13 days in 30%. In one case the successive periods were 42, 58, 87, 54, 48, 56, and 36 days apart. If conception had occurred in the 87-day cycle the duration of the pregnancy, reckoned from the first day of the last period, would have been 59 days longer than it would have been in a 28-day cycle—that is, 342 days. In other words, the patient would have seemed to be 59 days (8½ weeks) post-mature, whereas, assuming that ovulation occurred 14 days before the next period was due, she was only at term. Such abnormally long intervals can never be entirely excluded, for they may occur in a woman whose cycles have hitherto been no longer than usual. If she were examined early in pregnancy suspicion might be aroused by discrepancy between the size of the uterus and the menstrual dates, though here again there are many well-known pitfalls.

As, however, the average weight of the post-mature child is greater than that of the merely mature child, and as this greater weight must be due to the longer stay of the foetus in the uterus, it is unlikely that conception in a long menstrual cycle accounts for many cases of post-maturity.

Summary

A review of hospital reports shows that there are very large variations in the frequency of induction of labour for post-maturity without any significant differences in the perinatal mortality rates. In certain hospitals the induction rate is 30 times that in others in which induction for post-maturity is done.

In one hospital with approximately 5,000 deliveries in a year it was not done once, yet the stillbirth rate was the seventh lowest in the 32 hospital reports, and the caesarean section rate was 1.8%—the lowest in all the reports. There were no deaths from post-maturity either before or during labour.

The complications occurring in 596 surgical inductions for post-maturity are reviewed. They include long induction-delivery intervals and a high caesarean section rate (6.2%), the sections being usually done for prolonged labour due to disordered or abnormal uterine action.

It is suggested that many cases of so-called post-maturity are really examples of slow maturation of the foetus and placenta, and that as good or better perinatal mortality rates can be got in these cases without induction.

Others may be due to the occurrence of conception in a very long menstrual cycle.

The higher foetal mortality in post-mature as compared with term babies can be adequately explained by the larger size of the infants in the former and the longer duration of labour.

If, because of the larger size of the baby, there is disproportion, the case should be treated by trial of labour. Induction of labour is not the modern treatment for disproportion, at least in primigravidae.

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"The Health of Scotland" was the theme of a speech made last week by Mr. J. NIXON BROWNE, M.P., Joint Parliamentary Under-Secretary of State for Scotland, at the annual conference of the Scottish Branch of the British Red Cross Society. In 1949-50, the first full financial year of the National Health Service, £40m. was spent on the Service in Scotland; in 1956 the figure was £53m. Since 1949 the number of staffed hospital beds had risen from 58,700 to 63,000. Of these about 40% were reserved for mentally ill and mentally defective patients. In 1956 hospital out-patients numbered 7½ million, compared with 5 million in 1949; 4½ million pairs of spectacles had been issued since 1948, and 671,827 sets of false teeth since the charges for them were introduced in 1952. The number of family doctors in the Service had risen from 2,314 in 1949 to 2,603 in 1956, and there had been an encouraging growth of partnerships and group practices. The average number of patients per doctor, however, had fallen from 2,147 to 1,980. One feature in Scottish health statistics which had failed to improve much during the last 25 years was mortality among middle-aged males. The two main reasons for this were deaths from coronary thrombosis and from cancer, particularly lung cancer. The health record of Scotland was in some respects worse than that of England. One possible reason which had been suggested for this was that, according to the National Food Survey in 1954, "the Scots were inclined to indulge in a rather less nutritious diet than the English," eating more carbohydrates and less fruit, fresh vegetables, and meat.

SEDATION OF CHILDREN AS OUT-PATIENTS FOR DENTAL OPERATIONS UNDER GENERAL ANAESTHESIA

TRIAL OF METHYLPENTYNOL, BUTOBARBITONE, AND CHLORPROMAZINE

BY

R. GOULDING, M.D., B.Sc.

Lecturer in Pharmacology, Guy's Hospital Medical School

P. J. HELLIWELL, M.B., F.F.A.R.C.S., D.A.

Director, Department of Anaesthetics, Guy's Hospital

A. C. KERR, B.Sc., L.D.S.

Dental Research Fellow, Department of Dental Medicine, Guy's Hospital

AND

EILEEN M. WILKIN, B.Sc.

Amy, Lady Tate Scholar, Department of Psychology, Bedford College, London

Pre-operative sedation for dental out-patients requiring general anaesthesia is not commonly used, but is strongly advocated by Macintosh and Bannister (1952). It may not be necessary in adults, but the assumption that it is of value in the management of young children is widely held. It has been advocated as a method of reducing the emotional disturbances within a child about to undergo what otherwise may be a very frightening experience and as a way of reducing the outward expression of such emotions. It has also been suggested that the prevention of pre-operative terrors would remove the danger of post-operative emotional upsets.

The value of premedication for child in-patients has long been recognized. Basal narcosis has provided a satisfactory answer to the problem, except in the case of operations on the upper respiratory tract (Barnes, 1952). No safe and effective premedication technique has yet been devised for ambulatory children. Methylpentynol, however, has been claimed in both the medical and the lay press to be the ideal agent for this purpose. The statement by the makers of a brand of methylpentynol that their preparation has the "unique property of allaying fear and apprehension within a few minutes of its administration" suggested that its use as a premedicating drug for children should be carefully investigated.

The investigation described here was designed to study the effect of the pre-operative administration of three drugs to child out-patients attending hospital for dental extractions under general anaesthesia.

Conditions of Experiment

In Guy's Hospital two sessions each week are reserved for children between the ages of 2 and 15 years who require dental extractions under general anaesthesia. The children come from all parts of London and the neighbouring counties and from all classes of homes. A few require teeth extracted because of overcrowding of the mouth, but the majority require extractions because extensive caries has made the conservation of the teeth impracticable. A small number of teeth are removed for the immediate relief of pain.

The children are first seen in the dental department. If they need to have teeth extracted, instructions are given that they should be brought, without having had