

Breast development in the newborn

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SUMMARY Breast size and milk secretion was studied in term and preterm infants. Breast nodules were palpable in most of the mature infants, both boys and girls. In 6 term infants without palpable breast tissue there was a high incidence of complications during late pregnancy or delivery. In light-for-gestational age infants the breast diameter was generally appropriate for gestation. None of the infants under 31 weeks' gestation had palpable breast tissue at birth, but some in the first weeks of life developed breast tissue and secreted milk. Milk had been secreted by most of the mature infants by age 7 days, and the onset was earlier in light-for-dates infants. The breast does not regress rapidly after birth. The nodules persist into the second half of the first year by which time sex differences have emerged. Clearly the growth and activity of the neonatal breast cannot be explained solely in terms of the influence of maternal hormones towards the end of gestation. Further studies on early breast tissue development may indicate the other endocrine factors concerned.

Breast nodules are present in most newborn infants, boys and girls alike, and towards the end of the first week of life, gentle palpation of the nodules generally results in the release of milk. Histological studies have demonstrated that the nodules are formed of well developed breast tissue with lacteals, acini, and actively secreting alveolar cells.^{1,2} Biochemical analyses of the secretion have shown that it contains carbohydrate, proteins, and fats, and it has been suggested that it is similar to first milk in mothers.^{2,3} Detailed analyses have not been made. There is evidence that oestrogens, progesterone and mammatropic peptides, including prolactin and human placental lactogen, take part in the growth and development of breast tissue during pregnancy.⁴ However there is uncertainty about the extent that hormones, which act on the maternal tissues and are present in the maternal circulation, are responsible for the breast development in the newborn infant. The failure of many preterm infants to develop breast nodules or secrete milk after birth, indicates the importance of the intrauterine environment. On the other hand, the fetus itself produces a variety of hormones which may influence breast development—for example prolactin levels in the infant's blood are high at birth and in the succeeding days.⁵

If the fetal breast tissue is the end organ of oestrogen, progesterone, and prolactin activity, its size and behaviour after birth may provide interesting information on the differences in endocrine environment experienced by the infants before birth. The natural history of breast tissue growth and milk

release in the first year of life was examined in normal, healthy, and mature infants and compared with that of the small, preterm infant. The clinical features of infants who did not have breast tissue at birth are also reported.

Methods

The diameter of the breast nodule was measured by comparing the diameter of the palpable breast tissue with discs of standard size. Both breasts were measured and the results reported as the average of the two. All the measurements were made by one

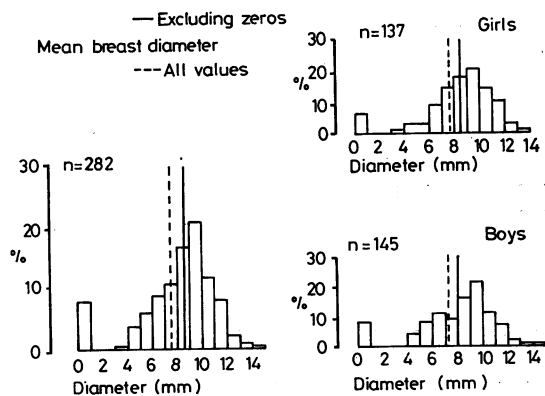


Fig. 1 Distribution of breast nodule diameter in 282 unselected newborn infants.

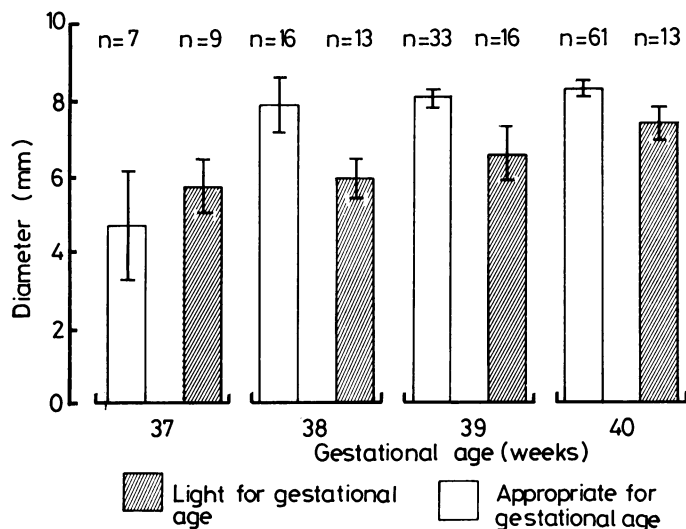


Fig. 2 Comparison of mean (\pm SE) breast diameter between AGA and LGA infants 37 to 40 weeks' gestation.

observer. If after firm palpation, secretion could be observed from the nipple, milk 'release' was judged to have taken place. The gestational age of each infant was calculated in completed weeks of pregnancy from the first day of the mother's last menstrual period. If this date was unknown gestation was estimated from ultrasound data. Infants were classified as either light-for-gestational age (LGA), or appropriate-for-gestational age (AGA), using the standards of Thomson *et al.*⁶ and allowing for sex of the infant and parity of the mother.

Measurements were made on (1) 282 unselected infants of varying weights and gestations within the first 2 days of life. (2) 98 infants of birthweights <3.0 kg. (3) 19 healthy infants, aged 5 to 8 months, attending child health clinics.

Serial measurements were made on (a) 21 term, healthy infants over the first 10 months of life, and (b) 23 preterm AGA infants who did not have palpable breast tissue at birth for the first 10 weeks of life. The time of onset of milk secretion was studied by serial observations in 4 groups of infants: 13 mature AGA infants, 21 LGA infants, 13 AGA infants of 34 to 37 weeks' gestation, and 19 AGA infants of 26 to 33 weeks' gestation.

Results

Breast nodule size. Breast tissue was palpable in most newborn infants and the measurement came within a normal distribution with the exception of the 21 infants in whom no breast tissue could be palpated (Fig. 1).

There was no difference between the sexes. Fifteen infants without palpable nodules had been born preterm but 6 had not, and these 6 had had a surprising incidence of problems during late pregnancy and delivery (Table). Sometimes mothers after their first pregnancy have difficulty establishing breast feeding, and milk comes more easily with second and subsequent pregnancies; however there was no significant difference between breast diameter in infants of first or subsequent pregnancies. It might have been expected that breast tissue being inessential, would be undersized in the undernourished newborn infant. That is certainly not so. Indeed the breast appears to grow according to gestation rather than according to body size (Fig. 2).

Table Details of the 6 term infants who did not have breast nodules at birth

Case	Birthweight (kg)	Gestation (weeks)	Delivery	Complication
1	2.95	41	Forceps	Static maternal weight in late pregnancy. Failure to progress in labour
2	3.2	39	Emergency caesarean section	Falling maternal weight in late pregnancy. Failure to progress in labour
3	2.78	38	Forceps	Failure to progress in labour
4	3.3	41	Forceps	Fetal distress. Birth asphyxia
5	2.82	44	Caesarean section	Maternal hypertension. birth asphyxia
6	4.08	40	Normal	—

The time in gestation when breast tissue becomes palpable varies greatly. It was found in some infants under 32 weeks' gestation, but was not palpable in one-third of infants of 36 weeks' gestation (Fig. 3).

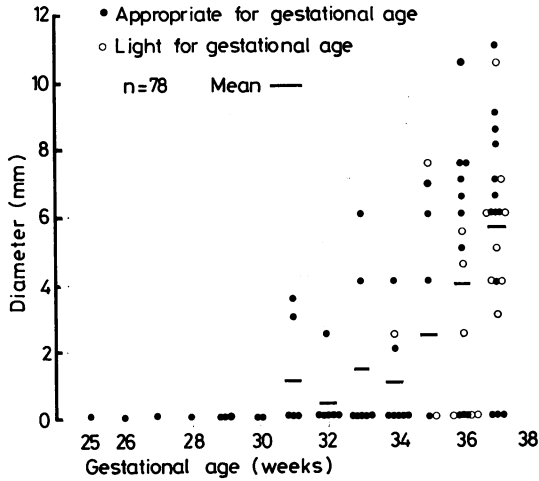


Fig. 3 Breast diameter in 78 preterm infants.

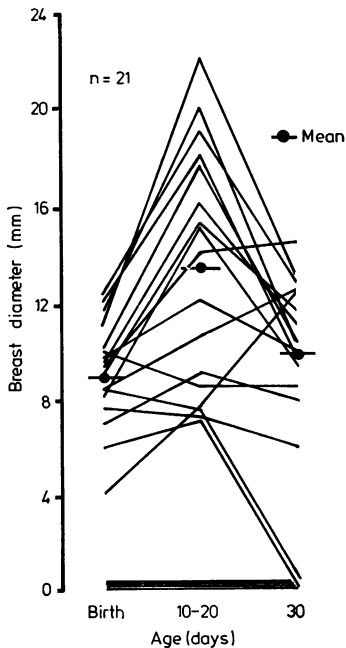


Fig. 4 Serial measurements of breast diameter in mature infants during the first month of life. Horizontal lines indicate the mean values for infants with breast nodules at birth.

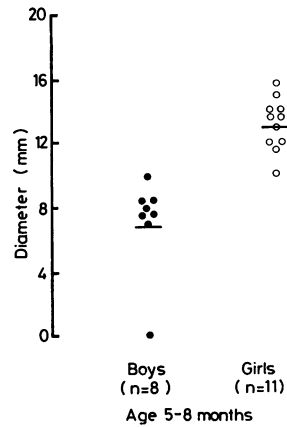


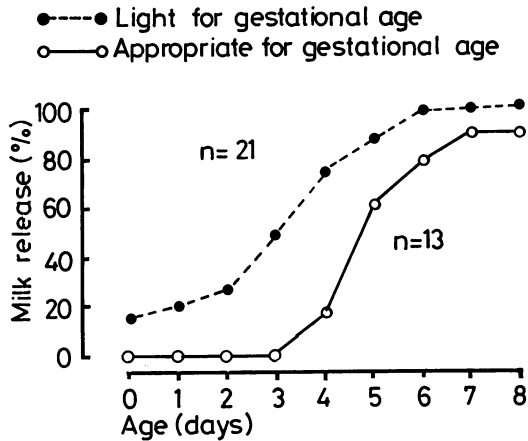
Fig. 5 Breast diameter in 19 infants.

In 23 preterm infants who did not have breast nodules at birth, breast tissue became palpable in over 40% of them during the first 9 weeks of life, although none developed large nodules of the size that are found in term newborn infants. In healthy mature infants, the diameter of the breast increased during the first 2 weeks of life after which it decreased to an average of about 10 mm (Fig. 4) where it remained until about 4-6 months of age. By this time there was a difference between boys and girls which was even more apparent by age 10 months (Fig. 5).

Milk secretion. In most mature term infants milk secretion first appeared between the 5th and 7th days of life. The onset of secretion was earlier in the infants who were LGA (Fig. 6). Of the mature infants, 17 of 19 were still secreting in the second week, 8 of 17 in the fourth, but none by the eighth week. Milk was released within the first 9 days of life in 7 of 13 preterm infants of 34 to 37 weeks' gestation. None of the more immature infants was secreting milk in the first week of life and later onset was noted in 4.

Discussion

Although the observation that breast tissue is present in the majority of term infants, and that milk secretion usually occurs in all of them, beginning on the 5th and 6th days of life, was made long ago,^{7,8} these findings do not appear to be generally appreciated. There have been a number of studies on the structural development of the breast in the fetus,^{1,8,9} and reports on the size of the breast



Light for gestational age

Birthweight mean 2.3, range 1.6-2.7 kg
Gestation mean 39.2, range 36-41 weeks

Appropriate for gestational age

Birthweight mean 3.4, range 2.8-4.1 kg
Gestation mean 39.7, range 36-41 weeks

Fig. 6 Cumulative percentage of AGA and LGA infants who had milk release in the first 8 days of life.

nodule at different gestational ages.^{10 11} Indeed breast size is an item in some programmes for assessment of gestation.¹² However, the histological development of the human breast does not relate well to gestational age,¹ and the wide variations which we and others have found make it a poor guide to maturity.

There have been few studies on the growth of the breast after birth. The increase in size during the first 2 weeks of life can probably be ascribed to engorgement with secretion, for the neonatal breast is not 'milked'. Lactation is therefore inhibited; if the breast is regularly massaged, milk secretion continues.^{1 2 13} Contrary to some statements,¹⁴⁻¹⁶ breast tissue does not immediately involute after birth; it is easily palpable in many infants of both sexes during the first 6 months of life. The breast nodule, on average, is larger and persists in girls. This finding is contrary to that reported by Nachtigall,¹⁷ who concluded that breast gland swellings disappeared in the 3rd month of life and that gender made no difference. The occasional failure of regression of breast nodules during the first year of life has been commented on by clinicians,¹⁸ and confirmed by histological studies.^{8 19} The pattern of persisting breast development we have

described is in accord with current views on the secretion of gonadotrophins and oestrogens in infancy.¹⁹

The failure of some preterm infants to develop breast tissue or to lactate in the neonatal period led some clinicians to give such infants gonadotrophic hormones and oestrogens. Initial reports were optimistic, but controlled trials were unable to sustain the evidence of benefit.⁷ However careful study shows that in some preterm infants breast tissue does develop after birth, presumably under the influence of the infant's own oestrogenic secretions and independently of the fetoplacental unit. The onset of milk secretion in some of these infants took place long after the progesterone withdrawal,²⁰ which might be expected to occur at the time of birth in mother and infant.

Lactation in the mother requires a high level of circulating prolactin.²¹ In the mature infant prolactin levels are high at birth and decrease during the subsequent weeks.⁵ In immature infants prolactin levels remain higher for longer (unpublished observations). The fact that many LGA infants secrete milk in the first 3 days of life suggests that they have been subject to 'progesterone withdrawal' earlier than AGA infants.

Six infants at 38 weeks' gestation or greater, of good birthweights, had no breast nodules. Most of these infants had some complication in the perinatal period suggesting that despite their apparent maturity, they were ill-prepared for delivery. Until we know more about the endocrine factors which control the growth and development of the fetal breast in physiological conditions, it is difficult to interpret the variation that occurs with disorder.

We thank our nursing and medical colleagues for assistance with this study.

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British Paediatric Association Junior Staff Group Meeting, Friday 2 October 1981

This meeting will be held at Guy's Hospital, London, and is open to all interested junior staff. The guest lecture will be delivered by Professor J S Cameron, professor of renal medicine.

In the evening, there will be a dinner for partici-

pants and their wives/husbands. The meeting is officially recognised for study leave.

The registration fee is £10 (including refreshments and dinner). Applications and papers, which may include case reports as well as research items, should be submitted to the organiser, Dr Richard Trompeter, Department of Paediatrics, Guy's Hospital, London SE1 9RT, by Monday 7 September 1981.