Archives of Disease in Childhood, 1978, **53**, 506–516

Short reports

Clinical study of prolonged jaundice in breast- and bottle-fed babies

Prolonged neonatal jaundice may be a sign of serious but rare disease. The more common and benign 'breast milk jaundice' was first described by Newman and Gross (1963) and Arias *et al.* (1964). However, we have been unable to find an incidence of breast milk jaundice quoted by these authors or in studies since. A recent impression that *prolonged* neonatal jaundice was occurring more frequently led us to study the incidence of prolonged jaundice in breast- and bottle-fed infants.

Patients and methods

All births over a 6-month period, from May to November, at the Louise Margaret Maternity Hospital, Aldershot, were included in the survey. Of the total births over this time (893), 55% of the babies were breast feeding on leaving hospital. Blood grouping, direct and indirect Coombs's tests were performed on all babies who were jaundiced within the first 3 days of life.

All babies who were jaundiced on discharge from hospital were seen again at 3 weeks of age. If they were still jaundiced, the following investigations were performed: serum bilirubin, thyroxine, alkaline phosphatase, aspartate and alanine aminotransferases, plasma proteins; full blood count; urine microscopy, culture and reducing substances. The infants were then reviewed as outpatients.

Results

Over the period of the study, 12 infants (6 boys, 6 girls) were found to have prolonged jaundice, representing 1·3% of all births and 2·4% of all breast-fed infants. All 12 had been breast-fed from birth. In no baby who was bottle fed from birth was prolonged jaundice found. In one infant (Case 5) breast feeding was abandoned at 18 days. The remaining 11 infants were breast fed for 38 days or more and all were breast fed at the time of the later bilirubin estimation given in the Table.

Clinical details. The gestational ages of the babies ranged from 37 to 42 weeks, mean 39·1 weeks. All were clinically well throughout the period of review.

Table *12 breast-fed infants with prolonged jaundice*

Case no.	*Birth-weight (g)*	*Weight gain over first 3 weeks (g)*	*Serum total (and conjugated) bilirubin (μmol/l)**	
			At age 3 w	*At later age*
1	3100	640	188	54 d: 66 (41)
2	3620	858	200	34 d: 101 (68)
3	2960	249	176	28 d: 87
4	4040	625	137	80 d: 25 (20)
5	3580	−192†	201 (28)‡	—
6	3240	−80†	195 (30)‡	—
7	4140	690	—	79 d: 89 (37)
8	3520	380	121	29 d: 45 (26)
9	2840	220	164 (24)	—
10	3620	35†	170 (38)‡	35 d: 45
11	2440	401	147 ‡	27 d: 86 (2)
12	3360	535	197 (46)	—

*Normal serum bilirubin: 6–17 μmol/l (0·35–0·99 mg/100 ml) total; 0–4 μmol/l (0–0·2 mg/100 ml) conjugated.
†Weight gain below 3rd centile.
‡Raised aspartate aminotransferase at 3 weeks.
Conversion: SI to traditional units—Bilirubin: 1 μmol/l ≈ 0·058 mg/100 ml.

None of the mothers had been on drugs; 4 of them had previously breast fed babies, none of whom had had more than transient early jaundice. No seasonal incidence was apparent.

Jaundice. Jaundice was first noted in the 12 babies in whom it became prolonged between the 2nd and 5th day of life. It reached its peak (daily estimations) between the 3rd and 14th day (mean 6·7 days). Clinical jaundice persisted for variable periods beyond the last estimation of serum bilirubin given in the Table. In Case 12 the jaundice disappeared 2 days after the mother stopped breast feeding her baby at 38 days of age, but in the remainder jaundice faded while the babies were still being breast fed.

Weight gain. At 3 weeks of age, 3 babies (Cases 5, 6, 10) were not thriving well. Case 5 was bottle fed from the 18th day and subsequently thrived. The remaining babies thrived on breast feeding from then on and the weight gain was at an above-average rate in 9 of the 11. One patient (Case 12) grew along the 50th centile and another (Case 11) along the 3rd centile.

Other investigations. Serum thyroxine, blood count, urine reducing substances and culture were normal in all patients at 21 days. In none was there evidence of haemolytic disease. In 4 there were slight elevations of aspartate aminotransferase (AST); 3 of the 4

were not thriving well. In one (Case 7) liver function tests were not performed until 79 days of age and AST was slightly raised although she was thriving well. Estimations of liver enzymes were not repeated as there was no clinical indication to do so. When conjugated and unconjugated bilirubins were estimated separately, the conjugated bilirubin was also raised (Table).

Discussion

Over the period of this study, prolonged neonatal jaundice was found in about 1 in 50 breast-fed babies and was not encountered in any baby who was bottle fed from birth. We do not know the cause of the prolonged jaundice in these breast-fed infants. However, our observation of a mixed conjugated and unconjugated hyperbilirubinaemia in the infants indicates that hepatic clearance of both forms of bilirubin was impaired.

When breast milk jaundice was first described, conjugated bilirubin levels were not raised in the patients reported by Newman and Gross (1963), though elevations in both unconjugated and conjugated bilirubin were found in the cases reported by Arias *et al.* (1964). *In vitro* studies of the inhibitory effect of the milk in breast milk jaundice have suggested that a combination of mechanisms may be present. These may include the inhibition of uptake into the liver cell of unconjugated bilirubin by fatty acids in the milk (Foliot *et al.*, 1976); inhibition of conjugation of bilirubin within the cell by these fatty acids (Arthur *et al.*, 1972; Foliot *et al.*, 1976) or by the steroid-3-α-20β pregnanediol (Arias *et al.*, 1964); or inhibition of secretion of conjugated bilirubin from the liver cell by 3-α-20-β pregnanediol (Bevan *et al.*, 1965; Hargreaves and Piper, 1971). However, this steroid is not consistently present in inhibitory milks (Ramos *et al.*, 1966). In spite of the similarity between the jaundice in our patients and breast milk jaundice, we have not used this term because we have no information on the biochemical content or *in vitro* effect of the milk; nor did we feel it justified to observe the effect of withdrawal of breast feeding on the serum bilirubin levels in the infants.

Poor weight gain has also been implicated in prolonged jaundice in breast-fed babies (*British Medical Journal*, 1970). Although 3 of our patients gained weight poorly in the first 3 weeks of life, 2 of these thrived well thereafter while breast feeding. This observation emphasises that breast feeding should continue in the majority of infants with this form of prolonged neonatal jaundice. The possibility of serious underlying disease is unlikely if there is no evidence of infection, hypothyroidism, galactosaemia, or hepatic dysfunction and investigations to exclude these conditions can be completed by 3 weeks of age. At this stage the anxieties of the mother can be allayed and the baby discharged to the care of the family doctor. Should the jaundice persist after breast feeding has stopped, further evaluation should then be undertaken to identify rare disorders such as the Crigler-Najjar syndrome.

Summary

A study of 893 births was undertaken to determine the incidence of prolonged neonatal jaundice. 55% of these babies were breast feeding on discharge from the maternity hospital. Jaundice lasting for 3 weeks or more was found in 12 breast-fed term babies (2·4% of all breast-fed babies), and in no bottle-fed infant. 3 of the jaundiced babies gained weight poorly in the first 3 weeks of life, but after that age failure to thrive was not associated with the prolonged jaundice. The hyperbilirubinaemia, which persisted in 11 infants from between 21 to 80 days (mean 39 days), was due to elevations in both conjugated and unconjugated fractions.

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