

## Short reports

### Transcutaneous bilirubinometry: an evaluation

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**SUMMARY** The transcutaneous bilirubinometer was evaluated in 60 term and 10 preterm infants. A significant correlation was found between the transcutaneous index and the total serum bilirubin concentration for both term and preterm infants. The reliability of the transcutaneous bilirubinometer as a screening method was confirmed, and index criteria for serum bilirubin analysis have been suggested for term babies. The instrument was precise and accurate and the method both non-invasive and atraumatic. Since individual serum bilirubin levels and the transcutaneous index may correlate poorly, the transcutaneous method cannot replace traditional serum bilirubin estimation.

The transcutaneous bilirubinometer has been developed to permit the non-invasive, non-traumatic monitoring of neonatal jaundice.<sup>1</sup> The principles of its operation were previously described in detail by

Yamanouchi *et al.*<sup>2</sup> This study set out to evaluate the precision, accuracy, and cost effectiveness of the instrument in the context of a busy perinatal service and in addition studied its correlation with total serum bilirubin values.

#### Patients and methods

During the study period all babies were assessed by the same experienced examiner (M S-P). A venous blood sample was taken for serum bilirubin analysis and a transcutaneous bilirubin index was simultaneously obtained from the glabellar area, this being the recommended site.<sup>1</sup> The serum bilirubin was analysed by a modification of the chemical method of Jendrassik Grof. All the term infants in the study were white and weighed more than 2.7 kg. The measurements were obtained on day 1 to day 8. Three term infants suffered from ABO incompatibility.

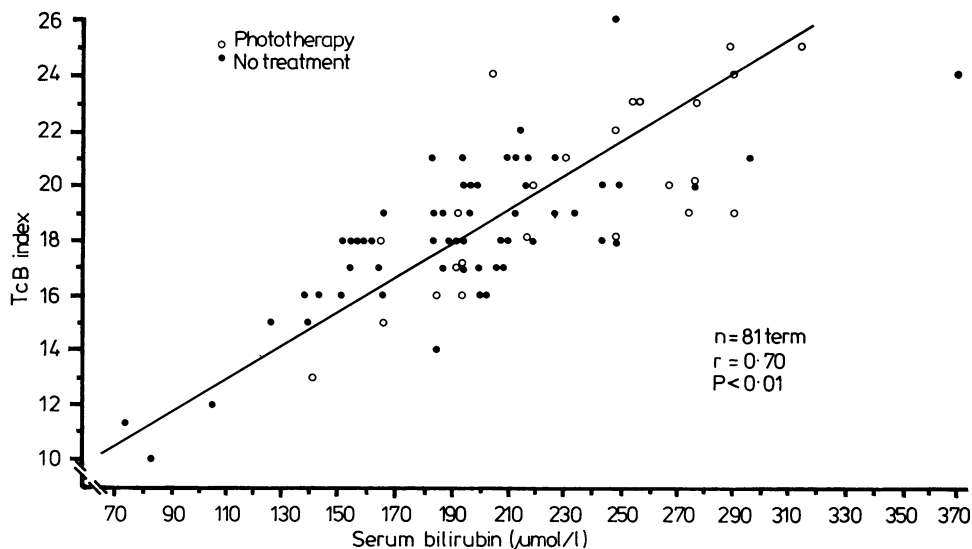


Fig. 1 Eighty-one measurements in term infants.

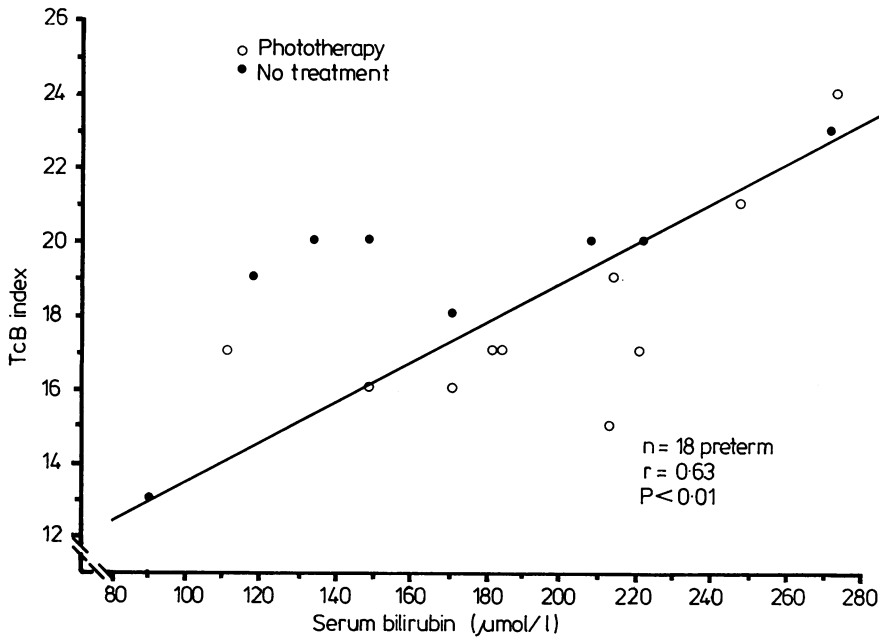


Fig. 2. Eighteen measurements in preterm infants.

**Results**

The reproducibility of the transcutaneous bilirubin values was assessed in 4 patients. Three or 4 sequential measurements were made in the glabellar area and the coefficient of variation was less than 5%, a figure consistent with precise clinical performance.

The 81 measurements on term infants are shown in Fig. 1. Separate analysis of 57 measurements in term babies on no treatment compared with 24 measurements in term babies on phototherapy gave r values of 0.65 and 0.76 respectively. The 18 measurements on preterm infants are plotted in Fig. 2.

Since an individual transcutaneous bilirubin index did not predict the serum bilirubin concentration (Figs 1 and 2) within the narrow range desired by the clinician we evaluated the instrument as a screening method.

The serum bilirubin results obtained in 57 term babies on no treatment were divided into three groups (Table). Using an index of 20 or greater as a criterion for taking a serum bilirubin level the clinician would detect all term babies with a serum bilirubin level greater than 250 µmol/l and would have no falsely negative screens. However, there would be a 75% false positivity on screening.

An evaluation of clinical screening compared with transcutaneous index as a screen is shown (Table). None of the 36 clinically mild cases was accompanied by a bilirubin level greater than 250 µmol/l. The clinically severe case was associated with a serum bilirubin level greater than 250 µmol/l. Three babies with a clinically moderate jaundice had serum bilirubin levels greater than 250 µmol/l.

Thus comparing clinical with transcutaneous index in screening effectiveness the transcutaneous

Table Serum bilirubin estimation and assessment of jaundice in 57 term babies on no treatment compared with the TcB index

TcB index	Serum bilirubin (µmol/l)			Jaundice		
	<190	190-250	>250	Mild	Moderate	Severe
<15	5	0	0	5	0	0
15-19	16	19	0	25	10	0
≥20	1	12	4	6	10	1

Conversion: SI to traditional units—bilirubin 1 µmol/l ≈ 0.058 mg/100ml.

bilirubinometer is somewhat more effective than clinical screening. If both transcutaneous index and clinical acumen were used simultaneously there would be considerably fewer false-positive screens.

### Discussion

Previous studies evaluating the transcutaneous bilirubinometer have been carried out in Japan by Yamanouchi *et al.*,<sup>2</sup> and in the USA by Hegyi *et al.*<sup>3</sup>

Hegyi *et al.*<sup>3</sup> obtained a correlation coefficient of 0.77 in forehead measurements on 43 white term infants on no treatment compared with our figure of 0.65. Yamanouchi<sup>2</sup> obtained a much more significant correlation coefficient of 0.877 in 40 measurements in the forehead area. Differences in methods of serum bilirubin analysis must be considered when noting the disparity, as Hegyi *et al.*<sup>3</sup> used a spectrophotometric technique and Yamanouchi<sup>2</sup> used the American optical bilirubinometer and an alkali AZO bilirubin method.

Our correlation coefficient of 0.76 in 24 term measurements during phototherapy treatment was in fact better than in the untreated group ( $r = 0.65$ ). Yamanouchi<sup>2</sup> however, found poor correlation of total serum bilirubin and transcutaneous index in term and preterm babies on phototherapy.

Since an individual transcutaneous index did not predict a serum bilirubin level accurately, we could not agree with Yamanouchi<sup>2</sup> that the instrument could serve as a viable alternative to traditional invasive procedures used to determine serum bilirubin concentration.

Evaluation of the screening potential of the instrument has not been previously undertaken. Our study (Table) confirms its value as a screening method in term babies on no treatment. There was an inadequate complement of measurements to establish index screening criteria in preterm infants.

Yamanouchi and Hegyi concluded from their

studies<sup>2,3</sup> that the instrument was precise and accurate and our findings confirmed this. Yamanouchi *et al.*<sup>2</sup> found that precision decreased at increasing serum bilirubin concentrations but there was no evidence of this in our data.

During the study we assessed a subgroup of 4 babies with rhesus haemolytic disease all of whom required exchange transfusion. There was a very poor correlation in the pre-exchange bilirubin level and the transcutaneous index measurement. After exchange transfusions the reduction in the level of serum bilirubin was not associated with any change in the transcutaneous index. This would agree with the opinion of Yamanouchi *et al.*<sup>2</sup> that the transcutaneous bilirubin measurement is contraindicated in rhesus haemolytic disease and in babies after exchange transfusion.

The transcutaneous bilirubinometer has a useful role in a busy maternity hospital with a frequent turnover of junior doctors and nursing staff. Its role here is to act as an adjunct to clinical screening in determining which term babies are likely to have serum bilirubin concentrations greater than 250  $\mu\text{mol/l}$ . It does not have a role as an alternative to serum bilirubin determination in all cases.

### References

- 1 Lucey J F, Nyborg E, Yamanouchi I. A new device for transcutaneous bilirubinometry. *Pediatr Res* 1980; **14**: 604.
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- 3 Hegyi T, Hiatt M I, Indyk L. Transcutaneous bilirubinometry. I. Correlations in term infants. *J Pediatr* 1981; **98**: 454-7.

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## Uncombable hair: a condition with autosomal dominant inheritance

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**SUMMARY** Uncombable hair is a familial abnormality of scalp hair structure which affects children and lessens as they grow older. It is suggested that the mode of inheritance of the condition is autosomal dominant.

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In 1973 Stroud and Mehregan<sup>1</sup> reported a patient with unusual hair which they termed 'spun glass hair'. In the same year Dupré *et al.*<sup>2</sup> described a similar hair abnormality which they called the 'uncombable hair syndrome' or 'pili trianguli et canaliculi' according to the ultrastructural finding.