Med. J. Malaysia Vol. XXXI No. 4, June, 1977

Phototherapy in neonatal jaundice

by *D. Sinniah*
M.A., M.D., M.R.C.P.I., M.R.A.C.P., D.C.H.

and *E. L. Lee*
M.B., B.S., M.R.A.C.P., M.Med.

Department of Paediatrics,
University of Malaya,
Malaysia.

THERE IS a high incidence of hyperbilirubinaemia among newborn infants in this part of the world (Sinniah, Tay and Dugdale 1971). Any measures that can cause a significant reduction in serum bilirubin levels and reduce the need for exchange transfusions will be a major contribution towards the management of these infants.

Phototherapy was first advocated for neonatal jaundice by Cremer, Perryman and Richards (1958). Despite use over many years, doubts are still being expressed as to its effectiveness and safety (Elliot, Moncrief and George, 1974). Although several studies have previously been carried out, there are no previous reports of a trial of phototherapy using individually matched control infants. The effectiveness of phototherapy in a multi-racial group of Malaysian infants has also not been evaluated.

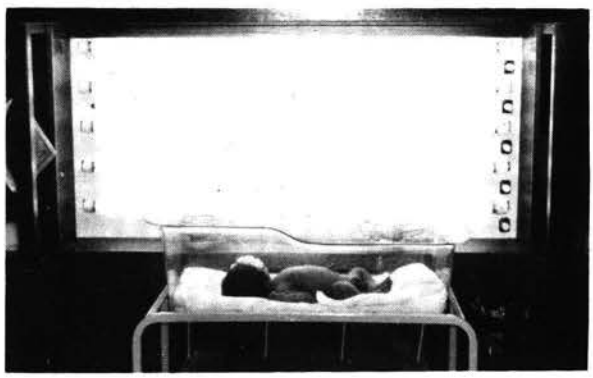

Fig.: Infant, nursed unclad except for eye pads receiving phototherapy.

Because of this, the present study was undertaken to evaluate the effectiveness of the postnatal treatment of neonatal hyperbilirubinaemia (S.B. > 10 mg/100 ml) in a group of Malaysian babies with phototherapy.

Material and Method

Babies born in the Maternity Unit, University Hospital, Kuala Lumpur, were observed daily for jaundice. Those with clinical jaundice which exceeded 10 mg/100 ml were studied. Twenty pairs of infants were matched for race, sex, maturity, birth weight, feeding and age. None of the infants had G.6-P.D. deficiency or blood group incompatibility. None had bruising, cephalhaematoma or other neonatal complications. None received phenobarbitone or other drugs known to influence serum bilirubin levels.

One group of infants served as controls. The other group received phototherapy continuously for at least for 48 hours. Phototherapy was provided from eight 40 watt, white fluorescent tubes (Philips TL 40W/54), emiting a radiant energy of 1.5 Joules per hour between 400 – 490 nm. The tubes were replaced every 200 hours after use. The infants were nursed unclad except for bandages covering the eyes and placed at a distance of 65 cm from the light source. A liberal fluid intake was ensured in all.

Serum bulirubin levels were determined on blood obtained by heel puncture at the beginning and at 24 and 48 hours after phototherapy in both control and phototherapy treated babies.

Results

Twenty matched pairs of infants were studied. The race, sex, gestational age, birth weight, age at the onset of the study and serum bilirubin levels of these infants are shown in Table I. The mean serum bilirubin levels in control and phototherapy treated infants were compared at the beginning and at 24 and 48 hours after phototherapy respectively. These are recorded in Table II. There was no significant difference between the mean gestational age and birth weight between the 2 groups ($P>0.6$; $P>0.6$ respectively). There was no significant difference between the mean serum bilirubin levels of control and phototherapy treated infants at the beginning of the study, but highly significant differences were observed at 24 hours and at 48 hours ($0.01>P>0.001$ and $0.01>P>0.001$ respectively) with significantly lower serum bilirubin levels being recorded in the group which received phototherapy.

No serious side effects were observed although an occasional infant become overheated and required cooling, and 2 babies developed loose green stools.

Discussion

The 2 groups of infants were matched as closely as possible to avoid possible interference by such variable factors as race, sex, gestational age, birth weight, feeding and age which are known to influence the serum bilirubin levels. Comparative studies between the 2 groups show phototherapy to be a safe and effective method of treating hyperbilirubinaemia in newborn babies. There was a definite fall in serum bilirubin levels in 17 of 20 babies receiving phototherapy, no change in 1 and a small rise in 2, compared with a definite fall in 7, no change in 2 and a definite rise in 11 of the control group infants at 24 hours.

Phototherapy generally reduces bilirubin levels by an average of 2 – 3 mg/100 ml within 24 hours and this rate is maintained during the period of phototherapy.

Although previous studies have shown phototherapy to be effective in the treatment of hyperbilirubinaemia, no matched control studies have so far been reported. The results of the present study are in accordance with observations made in other centres.

10 of the 20 pairs of infants studied were of either Malay or Indian racial origin, while the other 10 were Chinese. Skin pigmentation or the lack of it does not appear to influence the effectiveness of phototherapy which was as effective in Malay or Indian babies as in the Chinese. The effectiveness of phototherapy in Negro babies has been reported by Porto (1970).

Table I(A)

Clinical Data and Serum Bilirubin Levels in Control Infants and Those Receiving Phototherapy

Controls Case No.	Race	Sex	Birth wt. Kg.	Maturity in weeks	Age in days at start of phototherapy	Serum Bilirubin Levels in mg/100 ml		
						Start of phototherapy	24 hours later	48 hours later
1	C	M	3.3	40	4	14.0	16.0	13.0
2	C	M	4.0	40	3	14.0	17.0	13.0
3	C	M	3.3	40	3	13.2	10.0	12.0
4	C	M	3.6	40	5	17.3	13.2	12.0
5	C	M	2.0	32	4	13.2	13.2	–
6	C	M	3.3	40	3	12.0	19.2	–
7	C	F	2.9	38	4	15.2	15.0	15.3
8	C	F	3.3	38	3	12.0	14.4	–
9	C	F	1.7	37	4	16.8	14.2	13.2
10	M	M	3.1	39	6	13.2	14.4	9.6
11	M	M	3.1	40	5	13.1	11.0	9.0
12	M	M	1.5	30	4	13.2	14.4	–
13	M	M	1.8	40	3	14.4	16.8	14.4
14	M	F	2.2	34	4	13.2	12.0	11.3
15	M	F	2.6	38	7	18.0	15.6	13.1
16	M	F	2.9	40	5	14.8	16.4	11.0
17	M	F	3.0	40	5	12.0	13.2	18.7
18	I	M	2.0	37	5	12.0	13.2	–
19	I	M	1.6	39	2	12.0	13.2	18.7
20	I	F	2.2	34	5	14.4	14.4	–
MEAN			2.67	37.8		13.9	14.34	13.16

C = Chinese M = Malay I = Indian

Table I(B)

PHOTOTHERAPY Case No.	Race	Sex	Birth wt. Kg.	Maturity in weeks	Age in days at start of phototherapy	SERUM BILIRUBIN LEVELS in mg/100 ml Start of phototherapy	24 hours later	48 hours later
1	C	M	3.5	40	4	16.7	14.2	14.2
2	C	M	3.5	40	3	14.4	14.4	7.6
3	C	M	3.2	42	3	13.2	10.0	9.0
4	C	M	2.8	38	5	15.5	12.5	9.0
5	C	M	2.1	40	4	12.0	9.6	–
6	C	M	3.3	40	3	15.0	7.6	–
7	C	F	2.7	37	4	16.0	14.2	6.0
8	C	F	3.9	40	3	12.0	6.0	–
9	C	F	2.0	38	4	16.8	12.0	7.2
10	M	M	3.0	40	5	14.4	14.0	10.8
11	M	M	3.0	40	5	15.6	12.0	10.8
12	M	M	1.3	30	4	11.0	8.4	–
13	M	M	2.0	36	3	12.0	15.6	7.2
14	M	F	1.8	36	4	16.0	12.5	9.8
15	M	F	2.7	40	7	18.0	14.0	9.5
16	M	F	3.0	37	5	15.6	16.8	12.0
17	M	F	3.1	38	5	16.0	15.0	13.0
18	I	M	2.1	38	5	12.0	8.0	–
19	I	M	1.6	40	5	16.0	15.0	13.0
20	I	F	2.4	36	5	11.0	7.0	–
MEAN			2.64	38.3		14.46	11.99	9.94

C = Chinese M = Malay I = Indian

Table II

Mean Serum Bilirubin Levels in Control and Phototherapy Groups

GROUP No. of Patients	MEAN SERUM BILIRUBIN LEVELS in mg/100 ml Start of Phototherapy	24 hours later	48 hours later
Control	13.9 ± 1.74	14.34 ± 2.09	13.16 ± 2.78
Phototherapy	14.46 ± 2.08	11.99 ± 3.24	9.94 ± 2.40
Difference between means	0.56	2.35	3.22
Significance of difference (p)	$0.3 > P > 0.2$	$0.01 > P > 0.001$	$0.01 > P > 0.001$

No short term complications have been observed in this study apart from overheating, bronzing of the skin and loose green stools.

Summary

Twenty pairs of Malaysian babies with neonatal jaundice, matched for race, sex, gestational age, birth weight, age and feeding were studied; one group received phototherapy and the other served as controls. Significantly lower serum bilirubin levels were recorded both at 24 hours and 48 hours of phototherapy in the treated group. No serious side effects were observed apart from occasional overheating and loose green stools in 2 infants.

It is concluded that phototherapy is a safe and effective method of treating idiopathic neonatal hyperbilirubinaemia in babies of multi-racial origin as in Malaysia.

Acknowledgements

We express our appreciation to the China Medical Board of New York (Grant No. 70 – 171, Project No. 2) for donating an A.O. Bilirubinometer; the University of Malaya for providing the equipment needed to set up phototherapy and Mrs. Ng Mo Tsing for her secretarial assistance.

References

Sinniah, D., Tay, L.K., and Dugdale, A.E. (1971) Phenobarbitone in neonatal jaundice. Arch. Dis. Child., 46: 712.

Elliot, E., Moncrief, M.W. and George, W.H.S. (1974) Phototherapy for hyperbilirubinaemia in low birth weight infants. Arch. Dis. Child., 49: 60.

Cremer, R.J., Perryman, P.W. and Richards, D.H. (1958) Influence of light on the hyperbilirubinaemia of infants. Lancet, 1: 1094.

Porto, S.D. (1970) In vitro and in vivo studies on the effect of phototherapy upon bilirubin. Birth Defects: Original Article Series, vol. VI, No. 2, 83.