

Change in Serum Bilirubin Level in Changing Position

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Abstract

Aim: To compare the decrease in TSB concentration during phototherapy in infants treated in supine position exclusively versus infants alternated between exposure in supine & prone position every third hour.

Method: A total of 96 infants with nonhemolytic hyperbilirubinemia but otherwise healthy and gestational age > 34 week was randomized to one of the treatment groups. All neonates received phototherapy for 24h. TSB was measured at start of phototherapy and after 12 and 24 hr. of treatment.

Results: No statistically significant differences in the decrease in TSB were observed between the two treatment groups. At 12h of therapy, TSB decreased 30% in both group and at 24 hr 50% and 51% respectively.

Conclusion: The decrease in TSB was not significantly associated with positioning of the neonates during phototherapy in supine position or in alternating with supine & prone position.

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I. Introduction

Many of newborn suffers from jaundice and is generally harmless, but in few cases it may become severe and may develop bilirubin encephalopathy. Deposition of unconjugated bilirubin in CNS may lead to neurodevelopmental impairment.

Apart from giving prophylactic vit.K, phototherapy is most common mode of treatment for hyperbilirubinemia. Phototherapy isomerise bilirubin into water soluble isomer which is excreted by liver without conjugation. According to Vogl (1) effect of phototherapy is directly related to bilirubin concentration in skin while in other hand Donneberg (2) showed that there is no effect of position on final outcome of phototherapy. Soit may seems logical to change the position of infant regularly during conventional phototherapy.

Most of neonatal departments routinely change the position of neonates during phtotherapy. Yamauchi et al (3) showed that turning the infants from supine to prone position and vice versa every sixth hour did not have any better effect in comparison to treatment exclusively in supine position. But Shinewal et al (4) found that treatment in supine position is more effective than turning the infant every third hour.

Thus optimal position of the infant during conventional phototherapy remain unclear. We wanted to study the effect of phototherapy by comparing change in position of infant every third hour and treating infant in supine position exclusively.

II. Material and Methods:-

The study was conducted at neonatal intensive care unit at Department of Pediatrics, Nalanda Medical College and Hospital, Patna, India between 1st Feb. 2018 to 31st January. 2019. Inclusion criteria were neonates with nonhemolytic hyperbilirubinemia, otherwise healthy at time of inclusion, gestational age >34 week fulfilling the indication of phototherapy, postnatal age > 24 hr, not having received phototherapy for the last 48 hr. The infants were included consecutively. A total of 96 infants were included in the study. They were simply randomized equally by coin method to one of two phototherapy regimen: 50 infants were randomized to alternating position i.e. change every 3rd hour from supine to prone and vice versa, 46 infants were randomized to treatment exclusively in supine position. At start of phototherapy all infants were in supine position.

The indication for phototherapy followed the guidelines of Indian Pediatrics (5): Phototherapy limit was a total serum bilirubin concentration (TSB) in $\mu\text{mol/L}$ corresponding to 10% of birth weight in grams with a maximum of 300 $\mu\text{mol/L}$.

All infants received phototherapy for 24 hr. It was administered continuously except during feeding lasting 15-20 min every third hour. The infants were naked except for diapers and eye pads and placed in the radiant warmer. The infants were treated with light from above, and the distance from phototherapy apparatus to mattress was 25 cm. This distance was measured for each single infant.

The phototherapy apparatus used was Birdtech phototherapy device emitting blue light with an emission peak at 470nm and a bandwidth of 46-490 nm.

The light irradiance was measured at the infants head, trunk, and knees and mean value was calculated. The irradiances was measured by Neotech radiometer.

TSB was determined on capillary blood drawn by heal prick. It was measured at start of phototherapy and after 12 hr and 24 hr of treatment.

The sample size was calculated to demonstrate a 5% difference in decrease in TSB during the 24 h of treatment. Using $\alpha=0.05$ and $\beta=0.2$ (power 80%), the sample size was 89 patients.

During the first 180 min all infants were treated in supine position. From 180 to 200 min, phototherapy was discontinued for feeding & nursing and after that position of infants was either continued supine position or change to prone position for next 180 min. Three measurements were thus taken when the infant was in a resting state and the mean value was recorded.

The statistical analyses were performed by t-test using a significance level of 5%. The study was approved by ethics committee in Nalanda Medical College and Hospital, Patna , verbal and written informed consent was taken from parents of infants.

III. Results

Clinical data are shown in Table 1. The decrease in TSB after 12 and 24 hr treatment respectively is shown in table 2. No statistically significant differences in the decrease in TSB were found between the two groups. At 12 h of therapy, TSB decrease by 30% in both groups and at 24 hr 50% and 51% respectively. No side effect of phototherapy was observed except of loose stool in 4 infant in supine position and 3 infant in alternating position.

IV. Conclusion

The study showed that TSB decrease rapidly in the skin exposed to light and approached a plateau within the first 180 min. of treatment.

Though it seems logical to change the positing during phototherapy but despite of that maximum decrease in TSB of 50% at 24 hr in both the groups shows that decrease was not depending on changing the position on infants. Therefore it is reasonable to consider that phototherapy converts the bilirubin to photoisomers at the same rate whether in blanched skin or the yellowish skin of the infant with hyperbilirubinemia. In about 50% of the neonates breastfeeding was supplemented by formula but all preterm neonates have formula because of the increased fluid loss during the phototherapy.

The strength of study was the larger the sample size by which it would be possible to demonstrate even minordifference in the decrease in TSB between the groups.

On the other hand, when there was no difference in the effect of phototherapy regardless of position of the infants, we can give phototherapy in supine position to prevent sudden infant death syndrome.

Conclusion:-

Our study showed that changing the position of infants regularly during phototherapy does not increase the effect.

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Table - 1

	Supine position	Alternating Position
Number of infants	46	50
Gestational age (days) (median 95% CI)	255 (250;260)	252 (250; 258)
Birth weight(gm) (median 95% CI)	2700 (2500; 2900)	2800 (2500; 3100)
Gender female / male (n)	27/19	23/27
APGAR score < 7 / 5 min (n)	0	1
TTN	6	3
Weight loss (% of BW) (median, 95% CI)	6(4;7)	4(3;5)
Feeding during phototherapy		
Breast milk (% of the neonates)	37	33
formula feed (% of neonates)	12	15
	51	52
Mixed (% of the neonates)		

Table – 2: Decrease in total serum bilirubin during phototherapy in neonates in alternating positioning and neonates exclusively treated in supine position.

	Supine position	Alternating position	P-Value
TSB (µmol/l) (mean, 95% CI)			
Start of phototherapy	290 (280;300)	293 (231; 302)	0.92
after 12 hr of phototherapy	200 (190; 210)	201 (190; 209)	0.97
after 24 hr of phototherapy	151 (140, 164)	149 (137, 163)	0.76
Decrease in TSB (%) (mean 95% CI)			
after 12 hr of phototherapy	31 (30; 34)	32 (30;35)	0.87
after 24 hr of phototherapy	51 (47; 53)	51 (47; 54)	0.66

TSB =Total Serum Bilirubin concentration.

References:

- [1]. Vogl TP. On the dynamics of phototherapy. In: Brown AK, Showcare J, editors. Phototherapy for Neonatal Hyperbilirubinemia. Long term Implication. Sweden: NIH Publication, 1947;76:219-25.
- [2]. Donneberg ML, Knudsen KB, Ebbesen F. Effect of Infant Position on Serum Bilirubin Level During Conventional Phototherapy. Acta Paediatrica. ISSN 0803-553
- [3]. Yamauchi Y, Kasa K, Yamauchi I. Is it necessary to change the babies position during phototherapy? Early Hum Dev 1989; 20:221-7.
- [4]. Shinewal ES, Sciaky Y, Karplus M. Effect of Position Change in Bilirubin Level during Phototherapy. J Perinatal 2002;22:226-9.
- [5]. Indian Pediatrics guidelines for phototherapy, 2002;39-42.

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