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Original Research Article

Comparison of 12-Hourly Serum Bilirubin Reduction between Continuous and Intermittent Phototherapy in Term Neonates with Hyperbilirubinemia: A Randomized Controlled Trial

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Abstract

Background: This randomized controlled trial evaluated the efficacy of continuous versus intermittent phototherapy in term neonates with hyperbilirubinemia, focusing on 12-hourly serum bilirubin reduction trends.

Methods: One hundred term neonates (>37 and ≤42 weeks) requiring phototherapy as per American Academy of Pediatrics (AAP) guidelines were randomized into two groups: continuous phototherapy (2 hours ON, 30 minutes OFF) and intermittent phototherapy (2 hours ON, 3 hours OFF). Baseline demographics, gender, maternal and neonatal blood groups, birth weight, discharge weight, and hospital stay were recorded. Serum bilirubin levels were measured at baseline and every 12 hours until 48 hours. Data were analyzed using independent t-test and chi-square test.

Results: Both groups were comparable at baseline. Continuous phototherapy achieved significantly greater serum bilirubin reduction from 12 hours onwards ($p<0.05$ at each interval). Mean phototherapy duration was higher in the continuous group. No significant adverse effects were noted in either group.

Conclusion: Continuous phototherapy led to faster bilirubin decline than intermittent phototherapy, while both methods were effective in achieving safe discharge bilirubin levels. The findings support continuous phototherapy for rapid reduction in high bilirubin levels.

Keywords: Neonatal Jaundice, Hyperbilirubinemia, Phototherapy, Serum Bilirubin.

Introduction

Neonatal hyperbilirubinemia is one of the most common conditions requiring intervention in the neonatal period, with approximately 60% of term newborns developing clinical jaundice in the first week of life [1]. While physiological jaundice is benign, significant hyperbilirubinemia poses a risk for acute bilirubin encephalopathy and kernicterus if not treated promptly [2,3].

Phototherapy remains the mainstay of treatment, with two commonly employed modalities — continuous and intermittent phototherapy. Continuous phototherapy provides uninterrupted light exposure, whereas intermittent phototherapy alternates light exposure with rest periods, potentially reducing side effects such as dehydration and temperature instability [4,5]. Evidence comparing the efficacy of these two modalities in term neonates is limited and sometimes conflicting. Studies by Senthil et al. [6], Sachdeva et al. [7], and Suri et al. [8] have demonstrated varying degrees of bilirubin reduction and differences in hospital stay.

Given the paucity of consensus and limited Indian data, this study was conducted to compare 12-hourly serum bilirubin reduction trends in term neonates treated with continuous versus intermittent phototherapy.

Materials and Methods

This randomized controlled trial was conducted in the Department of Pediatrics, Government Medical College, Kota, Rajasthan, over a period of one year.

Inclusion Criteria

- Term neonates (>37 and ≤42 weeks gestation)
- Age >1 day of life and <14 days
- Serum bilirubin levels meeting AAP phototherapy thresholds

Exclusion Criteria

- Preterm and post term neonates
- Neonates with life threatening congenital malformations
- Major congenital malformations
- Hemodynamically unstable and on ventilator support

Randomization and Intervention: Eligible neonates were randomized into two groups of 50 each using computer-generated random numbers:

- **Continuous phototherapy group:** 2 hours ON, 30 minutes OFF
- **Intermittent phototherapy group:** 2 hours ON, 3 hours OFF

All neonates received standard supportive care including adequate hydration, temperature monitoring, and feeding support.

Data Collection: Baseline demographic details, maternal and neonatal blood groups, birth weight, discharge weight, and hospital stay duration were recorded. Serum bilirubin was measured at baseline, 12h, 24h, 36h, and 48hr and at time of discharge using the diazo method.

Statistical Analysis: Data were analyzed using SPSS software. Continuous variables were compared using independent t-test, categorical variables using chi-square test. A p-value <0.05 was considered statistically significant.

Results

Table 1: Baseline Demographic and Clinical Characteristics

Parameter	Continuous (Mean ± SD)	Intermittent (Mean ± SD)	p-value
Age at Admission (days)	2.8 ± 0.8	2.9 ± 1.0	0.829
Birth Weight (kg)	2.55 ± 0.49	2.67 ± 0.45	0.207
Discharge Weight (kg)	2.65 ± 0.50	2.77 ± 0.48	0.198
Hospital Stay (days)	3.2 ± 1.1	2.9 ± 1.0	0.304

Note: No statistically significant difference in baseline characteristics.

Table 2: Gender Distribution

Gender	Continuous (%)	Intermittent (%)
Male	46	46
Female	54	54

Note: Equal gender distribution in both groups occurred by chance, without deliberate matching.

Table 3: Maternal Blood Group Distribution

Blood Group	Continuous (%)	Intermittent (%)
A+ve	12	22
A-ve	2	2
AB+ve	6	6
AB-ve	2	2
B+ve	38	32
B-ve	2	4
O+ve	36	28
O-ve	2	4

Table 4: Neonatal Blood Group Distribution

Blood Group	Continuous (%)	Intermittent (%)
A+ve	20	24
A-ve	2	0
AB+ve	4	2
B+ve	46	46
B-ve	2	0
O+ve	22	28
O-ve	4	0

Table 5: Duration of Phototherapy

Parameter	Continuous Phototherapy (Mean ± SD)	Intermittent Phototherapy (Mean ± SD)	p-value
Total Duration of Phototherapy (hrs)	24.5 ± 4.7	17.46 ± 4.0	0.05

Table 6: 12-Hourly Serum Bilirubin Levels

Time Interval	Continuous (Mean ± SD)	Intermittent (Mean ± SD)	p-value
Baseline	18.87 ± 2.0	19.2 ± 1.9	0.42
12 h	15.8 ± 1.8	16.7 ± 1.8	0.02
24 h	12.4 ± 2.3	14.6 ± 2.2	<0.001
36 h	9.9 ± 1.9	12.4 ± 2.0	<0.001
48 h	8.0 ± 1.3	9.1 ± 1.4	<0.001

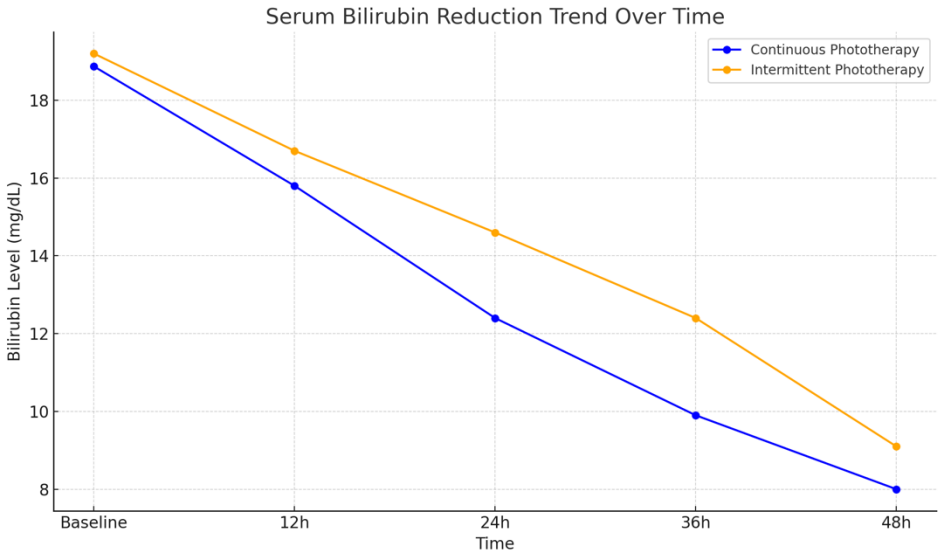

Figure 1: Trend of Serum Bilirubin Reduction Over Time in Continuous vs Intermittent Phototherapy Groups

Discussion

This randomized controlled trial compared continuous and intermittent phototherapy in term neonates with hyperbilirubinemia, focusing on 12-hourly serum bilirubin reduction trends. The baseline characteristics including age at admission, birth weight, discharge weight, gender distribution, maternal and neonatal blood groups, and hospital stay were comparable between groups, minimizing confounding variables.In our study, continuous phototherapy resulted in significantly greater bilirubin reduction from 12 hours onwards. By 48 hours, the continuous group achieved a mean bilirubin level of 8.0 mg/dL compared to 9.1 mg/dL in the intermittent group. This trend is consistent with Senthil et al. [6], who also reported faster decline with continuous phototherapy. Sachdeva et al. [7] observed similar efficacy in both modalities, though their intermittent schedule involved shorter OFF periods, which may explain the difference in results. Suri et al. [8] demonstrated comparable efficacy in mild hyperbilirubinemia but noted faster reduction with continuous phototherapy in higher baseline bilirubin levels, supporting our findings. Our results also showed that the mean phototherapy duration was significantly shorter in the continuous group, aligning with the findings of Suri et al. [8] and in contrast to studies where intermittent phototherapy duration was not significantly different [9,10].

Hospital stay duration in our study did not differ significantly, similar to the findings of Sachdeva et al. [7]. However, this may reflect early discharge policies once bilirubin reached safe limits rather than inherent differences in modality efficacy.

Conclusion

Continuous phototherapy provides faster bilirubin reduction than intermittent phototherapy in term neonates with hyperbilirubinemia, with shorter phototherapy duration and comparable safety. It may be preferred in cases with high initial bilirubin levels where rapid decline is desired.

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