

## A COMPARATIVE STUDY TO DETERMINE EFFICACY BETWEEN INTERMITTENT VERSUS CONTINUOUS PHOTOTHERAPY IN NEONATAL HYPERBILIRUBINEMIA

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### ABSTRACT

**Background:** Phototherapy is safe and effective in neonatal hyperbilirubinemia. Despite its worldwide application, questions regarding methods of optimizing efficacy remain unanswered. However it has its side effects like weight loss, dehydration, thrombocytopenia, electrolyte imbalance. Aim of this study was to compare the efficacy of intermittent with continuous phototherapy in neonatal hyperbilirubinemia.

**Methods:** Study was conducted in 200 neonates from October 2017 to September 2019 in MVJ Medical college and research hospital. All term and late preterm babies weighing >2500 grams with neonatal hyperbilirubinemia as defined by AAP charts (2004) requiring phototherapy. The neonates were randomly divided into two groups. Continuous phototherapy group(Group-A) received phototherapy as per standard protocol where off for phototherapy and the intermittent phototherapy(Group-B) group on and then off for two hours and one hour respectively. Serum total bilirubin levels were measured in 24hours and 48hours respectively. **Results:** two groups were comparable in gestational age, mean baseline bilirubin was 17.44mg/dl $\pm$ 1.02 in Group A 17.31 $\pm$ 1.04 in group B(p=0.37), while the mean follow-up bilirubin was 8.41mg/dl $\pm$ 0.59mg/dl in group A 8.28  $\pm$ 0.65mg/dl in group B (p=.14) and the mean difference between the baseline and follow-up bilirubin at 24hrs and 48hrs were not significant between two groups.

The difference between the mean gestation, mean baseline bilirubin, mean follow-up bilirubin, and the mean decrease in bilirubin for both the groups was statistically not significant. **Conclusions:** Intermittent phototherapy is as effective as continuous phototherapy without any major side effects.

**Keywords:** Phototherapy, Continuous, Intermittent

### INTRODUCTION

Phototherapy has emerged as the widest form of therapy for the treatment of neonatal unconjugated hyperbilirubinemia. In nearly all infants phototherapy reduces or blunts the rise of serum bilirubin concentrations, regardless of maturity, presence or absence of haemolysis, or degree of skin pigmentation (Maisels, 2005)

Two different mechanisms have been proposed to explain the action of phototherapy in reducing serum bilirubin concentrations in newborn infants; structural isomerization and photooxidation. (Ronald *et al.*, 2006)

Clinical studies comparing intermittent to continuous phototherapy have yielded conflicting results. Several studies failed to show the effectiveness of intermittent therapy.( Hoffman *et al.*, 1990)These results may have resulted from prolonged light-on and light-off cycles, for example, 6- to 12-hour on-off schedules (Maisels, 2008)

Photoisomerization of bilirubin occurs primarily in skin layers and the restoration of the bilirubin pool in the skin takes approximately 1 to 3 hours. Thus a prolonged on-off schedule may not be as effective as continuous therapy, but an on-off cycle of less than one hour is apparently as effective as continuous treatment (Chung *et al.*, 2004)

### MATERIALS AND METHODS

## Research Article

This study was conducted in postnatal wards from October 2017 to September 2019 including 200 neonates in MVJ Medical College and Research Hospital. The neonates were randomly divided into two groups. Continuous phototherapy (Group-A) received phototherapy as per standard protocol was off during breast feeding and the intermittent phototherapy group (Group-B) two hours on and one hour off. The phototherapy units were identical, serum total bilirubin levels were measured every 24 hours and 48 hours after starting phototherapy.

Informed consents were taken parents of those babies fulfilling the inclusion criterion.

The male/female ratio, mean gestational age and mean baseline bilirubin level was matched between the two groups A and B. The follow-up bilirubin was measured at 24 hours and 48 hours.

## RESULTS

There were 200 patients in our study. Gender wise the difference between the two groups, A and B, (p value=0.9) was statistically not significant with male predominance in both the groups.

Mean gestational age of the patients was  $37.92 \pm 1.17$  in group A  $38.04 \pm 1.14$  (p=0.463) in group B, there was no significant difference between two groups

For the group A babies, who received continuous phototherapy, the mean gestational age on admission was  $37.92 \pm 1.17$ , the mean baseline bilirubin the was  $17.44 \text{ mg/dl} \pm 1.02$ , the mean follow-up bilirubin was  $11.75 \text{ mg/dl} \pm 2.75$  and  $8.41 \text{ mg/dl} \pm 0.59$  in group A at 24<sup>th</sup> and 48<sup>th</sup> hourly respectively and the mean difference between the baseline and follow-up bilirubin at 48<sup>th</sup> hour was  $9.03 \text{ mg/dl} \pm 0.81$ .

For the group B babies, who received intermittent phototherapy, the mean gestational age on admission was  $38.04 \pm 1.14$ , the mean baseline bilirubin the was  $17.31 \text{ mg/dl} \pm 1.04$ , the mean follow-up bilirubin was  $11.93 \text{ mg/dl} \pm 2.35$  and  $8.28 \text{ mg/dl} \pm 0.65$  in group B at 24<sup>th</sup> and 48<sup>th</sup> hourly respectively and the mean difference between the baseline and follow-up bilirubin at 48<sup>th</sup> hour was  $9.03 \text{ mg/dl} \pm 0.97$ .

**Table 1: Comparison between two groups**

|                | Continuous Phototherapy |      | Intermittent Phototherapy |      | P value |
|----------------|-------------------------|------|---------------------------|------|---------|
|                | Mean                    | SD   | Mean                      | SD   |         |
| Pre TB         | 17.44                   | 1.02 | 17.31                     | 1.04 | 0.371   |
| Post 24hrs TSB | 11.75                   | 2.75 | 11.93                     | 2.35 | 0.629   |
| Post 48hrs TSB | 8.41                    | .59  | 8.28                      | .65  | 0.14    |

## DISCUSSION

Approximately 60% of full-term infants and 80% of premature infants develop jaundice due to hyperbilirubinemia during neonatal period. Also 5-10% of them require treatment by phototherapy (Bhutani *et al.*, 2015)

Clinical studies comparing intermittent with continuous phototherapy have shown conflicting results. Because exposure to light hasten excretion of bilirubin, continuous phototherapy should be more effective than intermittent one. However, because the efficiency of phototherapy is mainly related to the initial bilirubin concentration, efficiency will decrease as the bilirubin falls. Rebound into the skin probably takes place when there is an interruption of phototherapy but a question that remains unanswered is whether or not this brief elevation in skin bilirubin might improve efficiency when light therapy is restarted (Niknafs *et al.*, 2008). In practice, however, short on-off cycles (less than one hour) complicates nursing care and are probably more trouble than may be worth (Maisels, 2008).

The difference between the mean gestational age on admission, mean baseline bilirubin, mean follow-up bilirubin, and the mean decrease in serum bilirubin for both the groups A and B was statistically not significant.

We planned this study to find a way of decreasing burden on hospital staff and providing the parents, a more acceptable way of treating their jaundiced babies.

### Research Article

Our results of this study were similar to those of Niknafs *et al.*, 2008; and Sachdeva *et al.*, 2008 in that there was statistically no significant difference in the effectiveness (mean decrease in serum bilirubin) of both types of phototherapy.

In contrast to our study Houshmandi *et al.*, 2015 shows continuous phototherapy is more efficacious in terms of percentage of decrease in bilirubin compared to intermittent phototherapy though both intervention decreased bilirubin after phototherapy.

Comparing results of different studies is difficult because characteristics of the groups were completely different like race, age, birth weight, pre-term or full-term infant, initial level of bilirubin, type of phototherapy lights and on and off time for phototherapy all can be effective in determining the decrease in bilirubin level.

Intermittent phototherapy will also help in maintaining mother-infant bonding, encouraging breast feeding and through this it will help in achieving well-nourished and healthy babies. Moreover by involving mothers of the patients in the nursing care (like cleaning, feeding, changing diapers) of the babies, so the burden is shared between the mother and staff. In this way the mother will look after their babies, so they will be more satisfied.

### CONCLUSION

Intermittent and continuous phototherapies were found to be equally effective in treating neonatal hyperbilirubinemia because of its additional benefits, intermittent phototherapy recommended mode of therapy in treating neonatal hyperbilirubinemia instead of continuous phototherapy in neonatal care units and postnatal wards, however, it needs to be confirmed by large-scale RCTs.

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