ORIGINAL RESEARCH PAPER

Volume-7 | Issue-2 | February-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A STUDY ON IMPACT OF COVERING THE HEADS OF ICTERIC NEONATES DURING PHOTOTHERAPY ON THE PREVALENCE OF HYPOCALCAEMIA

Paediatrics

Raji Ramachari — Senior Assistant Professor in Pediatrics, Government Kilpauk Medical College, Chennai, India.

Divya Panneerselvam* — Senior Resident in Pediatrics, Government Kilpauk Medical College, Chennai, India.*Corresponding Author

ABSTRACT

Background: Jaundice is one of the most common causes for hospital admission in the newborn period. If left untreated it can progress to kernicterus, which can affect the neuro developmental outcome in babies and may also lead to death. Phototherapy is one of the most reliable, safe methods to treat hyperbilirubinemia and one of the commonest side effect is hypocalcaemia. There is some evidence that the use of a stockinet cap to cover the head prevents phototherapy-induced hypocalcaemia. In this present study we examine the effect of head cover on the prevalence of hypocalcaemia during photo therapy.

Methods: This single blind randomized controlled study, with 150 term neonates admitted in NICU at GKMC, for a period of six months. The study group was divided into Group A and Group B with 75 each. Group A underwent Phototherapy without head cap (Control) and Group B underwent Phototherapy with head covered with cap (Intervention). The serum calcium level of each newborn was tested at baseline and 48 hours after phototherapy.

Results: Out of 75 neonates in group A 34 had serum total calcium less than 7mg/dl (hypocalcaemia), whereas in group B only 15 had serum total calcium less than 7mg/dl.

Conclusion: Simple intervention like covering the head of neonates with cap reduces the incidence of hypocalcaemia.

KEYWORDS

Head Cap, Hypocalcaemia, Jaundice, Phototherapy.

INTRODUCTION

Jaundice occurs in 80% of preterm and 60% of term babies. Bilirubin encephalopathy is one of the main cause for the neurological manifestations like chorea, athetosis later in life. 60 % of term newborns are afflicted with jaundice in the first week of their birth [1]. Phototherapy is one of the most reliable, safe methods to treat hyperbilirubinemia and prevent complications like kernicterus. It lowers the serum bilirubin level by transforming bilirubin into water-soluble isomers that can be eliminated without conjugation in the liver [2, 3]. Phototherapy may lead to complications including skin rash, diarrhea, hyperthermia, chills, dehydration, DNA damage to lymphocytes, retinal degeneration, bronze baby syndrome especially in cholestatic jaundice and PDA opening in LBWs and hypocalcaemia [4]. There are several theories to explain the effect of phototherapy on calcium metabolism. Phototherapy leads to inhibition of pineal gland via transcranial illumination, resulting in a decline in melatonin level which stimulates secretion of corticosterone and reduces calcium absorption by bones, as a result, hypocalcaemia develops [5]. Since hypocalcaemia is accompanied by a decrease in serum melatonin concentration, this effect can be prevented by shielding the occiput with head cap [6]. In this present study we examine the effect of head cover on the prevalence of hypocalcaemia.

MATERIALS AND METHODS

This single blinded randomized controlled trail was done in Neonatal Intensive Care Unit of Government Kilpauk Medical College and Hospital, Chennai 10, during June 2014 to December 2014. The total sample size was 150 and the study group was divided into Group A (n = 75) Phototherapy without head covered and Group B (n = 75) Phototherapy head covered with cap. The serum calcium level of each newborn is being tested at baseline and 48 hours after phototherapy. Inclusion Criteria - Term neonates (37 completed to 41 weeks). Exclusion Criteria – 1. With Jaundice in first 24 hours of life, 2. Infant of diabetic mother, 3. Birth asphyxia, 4. Who had exchange transfusion, 5. With jaundice lasting more than 14 days of life, 6. Neonatal sepsis, 7.Neonates with congenital malformations, 8. Neonates with inborn error of metabolism, 9. Preterm. Group Assigned - Group A: Phototherapy without head covered, Group B: Phototherapy with head covered. Intervention - Covering the head with cap in group B neonates.

Newborns who were found to be icteric, by clinical examination using Kramer's rule, were estimated for their serum bilirubin. Those whose values exceeded the cut off point for starting phototherapy by the AAP normogram were selected. After checking for all the exclusion criteria, they were included into the study, after informing and obtaining their written consent. Babies were randomized into the two groups with randomization done using randomization tables.. Total sample size studied was 150. Neonates of group A received phototherapy without their head being covered. Neonates in group B received phototherapy with their head covered. Both these groups were being subjected to phototherapy using 6 fluorescent lamp with blue light spectrum, at a distance of 35 to 40 cm from the babies. They were being subjected to phototherapy continuously only being interrupted during the time of breast-feeding.

Babies serum total and ionized calcium was measured both before and after 48 hours of start of phototherapy, along with serum bilirubin. They were also monitored for side effects closely. Phototherapy was stopped once their serum bilirubin level decreased to that of 2mg/dl below the age specific threshold according to the AAP normogram.

Data's regarding the babies weight, blood group, mother's blood group, peripheral smear, haemoglobin, coombs test, liver function test, and serial bilirubin was measured to stop phototherapy. Monitoring and follow up data's were recorded. Babies were managed as per standard protocol and they were checked for any side effects. Data's obtained were analyzed for any statistical significance.

Total serum calcium estimation was done by “End point calorimetric method” using O – Cresolpthalein Complexone or OCPC.

The discrete variables were analyzed using the paired T test and P value of < 0.05 was considered as statistically significant

REFERENCE VALUE

HYPOCALCEMIA: Total calcium < 7mg/dl, ionized calcium < 4 mg/dl.

RESULTS

A total of 150 neonates were included in this study. They were divided into two groups of 75 each. The mean weight and age of the neonates were 2.49±0.52, 2.51±0.51 kilograms and 4.63±0.91, 4.45±0.89 days in Group A and Group B respectively. The male and female ratio was 1.2:1. The average time of phototherapy was three days (range: 3-5 days). The peak bilirubin level in both the groups were 16.53±1.95mg/dl and 16.4±1.97mg/dl in Group A and Group B respectively.

TABLE 1 - CLASSIFICATION OF STUDY GROUPS

GROUP	SEX		TOTAL
	MALE	FEMALE	
GROUP A (CONTROL)	30 (40%)	45(60%)	75(50%)
GROUP B (INTERVENTION)	53(70.7%)	22(29.3%)	75(50%)
TOTAL	83(55.3%)	67(44.7%)	150(100%)

TABLE 2 - SERUM CALCIUM LEVELS IN THE GROUPS

GROUP	BEFORE PHOTOTHERAPY		AFTER PHOTOTHERAPY	
	TOTAL Ca	IONISED Ca	TOTAL Ca	IONISED Ca
GROUP A	10.16	4.49	8.57	4.20
GROUP B	10.18	4.47	9.57	4.36

Thus covering the head of newborns during phototherapy causes significant lesser degree of fall in both total and ionized serum calcium level.

HYPOCALCEMIA BASED ON TOTAL SERUM CALCIUM FOLLOWING PHOTOTHERAPY

Out of 75 neonates in group A, 34 had serum total calcium less than 7mg/dl (hypocalcaemia), whereas in group B only 15 had serum total calcium less than 7mg/dl.

TABLE 3

GROUP	SERUM TOTAL Ca		TOTAL
	< 7mg/dl	>7 mg/dl	
GROUP A	34(45.3%)	41(54.7%)	75
GROUP B	15(20%)	60(80%)	75
TOTAL	49(32.6%)	101(67.3%)	150

Using head cover, in group B reduced the incidence of hypocalcaemia, based on total serum calcium significantly.

HYPOCALCEMIA BASED ON THE SERUM IONISED CALCIUM FOLLOWING PHOTOTHERAPY

Out of 75 neonates in Group A, 37 had serum ionized calcium less than 4mg/dl (hypocalcaemia), compared to 14 in group B.

TABLE 4

GROUP	SERUM IONISED Ca		TOTAaL
	<4 mg/dl	>4 mg/dl	
GROUP A	37(49.3%)	38(50.7%)	75
GROUP B	14(18.7%)	61(81.3%)	75
TOTAL	51(34%)	99(66%)	150

Thus using head cover reduces the incidence of hypocalcaemia based on total and ionized serum calcium.

DISCUSSION

Before Phototherapy, the difference between the serum calcium levels between two groups was not statistically significant. Following phototherapy of 48 hours duration the mean serum total calcium was 8.57 ± 1.64mg/dl and 9.57 ± 1.52mg/dl in group A and group B respectively. The mean ionized calcium was 4.2 ± 0.38mg/dl and 4.36 ± 0.30mg/dl respectively in group A and group B respectively (Table 2). Our study shows that there was a significant fall in the serum calcium level. This proves that phototherapy causes hypocalcaemia.

The fall was less in group B compared to group A. There is a definite association between covering the head with cap and the mean serum calcium levels, following phototherapy. This indicates that covering the head of neonates, helps in reducing the prevalence of hypocalcaemia. These findings were consistent with that obtained by Nouh et al [7].

In group A 34 (45.3%) neonates out of 75 had serum calcium < 7mg/dl, whereas in group B it was 15 (20%) neonates (Table 3). Thus there is a statistical significant difference between the incidences of hypocalcaemia based on total serum calcium between the groups. P value 0.002 (<0.05). This proves that covering the head of neonates during phototherapy reduces the incidence of hypocalcaemia. In study conducted by Nouh et al incidence of hypocalcaemia in those without head cover was 29% while incidence of hypocalcaemia in those with head cover was 15.6% values were slightly lesser than that observed in our study.

In group A 37(49.3%) neonates and in group B 14(18.7%) neonates had hypocalcaemia based on serum ionized calcium (Table 4). Based on the statistical results there was significant difference in the association of hypocalcaemia between the two groups. P value 0.021(<0.05). It was found that incidence of hypocalcaemia is lesser in those with their heads covered, than in those without their head covered.

In our study we observed a lesser incidence of hypocalcaemia with head cap (Group B). These results were consistent with study conducted by Ehsanipour et al[6], where the incidence of hypocalcaemia in term neonates without the head cover was 77.7%, incidence of hypocalcaemia in those with head cover was 22.2%, in our study incidence was much lower. In a study conducted by In Rajesh et al[8] study, 2011, observed a significant fall in ionized calcium level in 66.6% of term and 80% of preterm newborns in the study group. In Fatemeh Hajiv [9], study, the results were 15 neonates (7.5%) developed hypocalcaemia. Similarly in Karamifar's[5], study, 8.5% of term neonates had hypocalcaemia. In another study, Arora S et al, study[10], showed that out of 56 term newborn, 30(56%) developed hypocalcaemia which were consistent with our results. All these studies proves the protective role of head cap in prevention of phototherapy induced hypocalcaemia.

None of the infants developed severe complications of hypocalcaemia. 2 of hypocalcaemia term babies had symptoms of jitteriness. They were treated with supplemental calcium. Other hypocalcaemia neonates were treated with supplemental calcium. Their serum calcium was followed up to confirm normal values. Other side effects of phototherapy like skin rash was seen in around 10% neonates. Fever was present in around 30% of neonates. Some had loose stools.

LIMITATION OF STUDY

Other factors influencing serum calcium levels like serum albumin, magnesium levels was not studied. These factors may influence serum calcium levels. Future studies may need to take into account these factors.

CONCLUSION

Thus phototherapy induced hypocalcaemia in icteric neonates can be prevented by simple intervention like covering the head of neonates with cap.

REFERENCES

1. Khosravi N, Samaie H, Mozhdehiazar K. Percentage of serum albumin in full term newborns in Shahid Akbar Abadi Hospital. Razi Journal of Medical Sciences. 2001;23:15-7. [In Persian]
2. Cloherty. John P ann neonatal hyperbilirubinimia R. Stark "Manual of neonatal care 7th edition"2004, 304-39, print.
3. Stokowski LA., (2006): Fundamentals of phototherapy for neonatal jaundice. Adv Neonatal Care.; 6(6):303–312.
4. Xiong T, Qu Y, cambier S, Mu D. (2011): The side effects of phototherapy for neonatal jaundice, Eur J Pediatr. Oct;170(10): 1247-55
5. Karamifar H, Pishva N and Amirhakimi GH, (2002): Prevalence of phototherapy-induced hypocalcemia. Iran J Med Sci.; 27(4):166–168.
6. Ehsanipoor F, Khosravi N and Jalali S., (2008): The effect of hat on phototherapy induced hypocalcemia in icteric newborn. Razi J Med Sci.;15(58):25–29.
7. Nouh et al "Impact of covering of heads of icteric neonates during phototherapy on the prevalence of hypocalcaemia".
8. Rajesh Kumar Yadav, R.S, Sethi, Anuj S. Sethi and Lalith Kumar, (2011): Om Shankar Chaurasia Department of Paediatrics, M.LB. Medical College, Jhansi – 284128 (Uttar Pradesh)
9. Fatemeh Haji, EbrahimTehrani; Zarisabet ; Zohreh, Kavehmanesh and mohamma, dmirzaei, (2014): The Effect of Phototherapy on Serum Calcium Level in Full Term Neonates Article 8, Volume 2, Issue 2, Page 57-60.
10. Arora S1, Narang GS2 and Singh G3, (2014): J. Nepal Paediatr. SOC. Vol 34/Issue 1.