



A PUBLICATION ON STUDY OF PHOTOTHERAPY INDUCED HYPOCALCEMIA IN NEONATES

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ABSTRACT

Introduction: Neonatal hyperbilirubinemia is a common problem in newborns during first week of life. High unconjugated bilirubin levels are toxic to developing brain leading to irreversible neurological impairment. Phototherapy leads to inhibition of pineal gland via transcranial illumination resulting in decline in melatonin levels, in turn diminishing the release of ACTH and finally decreases the calcium resorption from bones causing hypocalcemia. **Materials and methods:** This is a prospective cohort study which include 100 newborn babies, both term and preterm babies. Serum calcium levels were checked before and after phototherapy and changes in level of serum calcium compared. **Results:** Decreased calcium levels in 86 % (n=86) neonates, hypocalcemic range in 5 % (n=5) neonates, 3 % (n=3) newborns had symptomatic hypocalcemia. **Conclusion:** Phototherapy is an independent risk factor for hypocalcemia .Newborns under phototherapy should be monitored closely for signs and symptoms of hypocalcemia and promptly treatment should be started for symptomatic hypocalcemia.

KEYWORDS : Phototherapy, Hypocalcemia

INTRODUCTION:

Neonatal hyperbilirubinemia is a common problem in newborns during first week of life. High unconjugated bilirubin levels are toxic to developing brain leading to irreversible neurological impairment. Neonatal hyperbilirubinemia can be treated with phototherapy or exchange transfusion or pharmacological agents. Phototherapy leads to inhibition of pineal gland via transcranial illumination resulting in decline in melatonin levels, in turn diminishing the release of ACTH and finally decreases the calcium resorption from bones causing hypocalcemia. Phototherapy lead to side effects which include skin rash, diarrhea, weight loss, increase in body temperature, bronze baby syndrome etc.

Calcium is essential for many biochemical processes, including blood coagulation, cellular enzymatic activity, cell membrane integrity and function, and neuromuscular excitability. Signs of hypocalcemia are usually non-specific like irritability, jitteriness, seizures, apnea, hyperreflexia and stridor.

AIMS AND OBJECTIVES:

AIM:

To evaluate the effect of phototherapy on serum calcium levels in neonates requiring phototherapy.

OBJECTIVES:

(a) To compare serum calcium levels before and after phototherapy in neonates. (b) To find the incidence of symptomatic hypocalcemia in neonates receiving phototherapy.

MATERIALS AND METHODS:

This study was conducted among term and preterm neonates admitted in NICU with neonatal jaundice at Prathima Institute of Medical Sciences, Karimnagar, Telangana. This study is done to compare serum calcium levels before and after phototherapy in neonates

Study Design –

Prospective Observational study

Study population-

Term and preterm neonates with neonatal jaundice admitted into NICU were enrolled in the study

Study duration - From June 2022 to March 2023.

Inclusion Criteria:

Neonates receiving phototherapy for unconjugated bilirubinemia.

Exclusion Criteria:

Neonates (a) with comorbidities like birth asphyxia, septicemia, renal failure (b) whose mother had history of taking anticonvulsants (c) who had exchange transfusion (d) with jaundice lasting more than 14 days of life.

METHODOLOGY:

Venous blood samples were collected from neonates included in the study and sent for total bilirubin, direct bilirubin, serum calcium and blood grouping.

Principle:

Total and direct bilirubin is measured by Diazo method; Calcium is measured by Arsenazo method; Blood group of newborn analyzed by antisera method.

Data Analysis:

Serum calcium levels were checked before initiation of phototherapy (first sample) and at discontinuation of phototherapy (second sample). Comparative study was made between these two sample groups to determine changes in levels of serum calcium.

RESULTS:

Table 1: Comparison of Mean Serum calcium before and after phototherapy by Paired t test.

Time point	Mean	SD	Mean diff	t- value	P- value
Before treatment	9.40	1.00	0.53	6.29	<0.0001
After treatment	8.87	1.19			

Table 2: Comparison of decrease in Calcium levels with

duration of phototherapy (p-value -0.001)

Duration of phototherapy	Increase of serum calcium	Decrease of serum calcium	Total
< 48 hrs	10	38	48
>48 hrs	0	52	52
	10	90	100

Table 3: Variation of serum calcium in relation to Gestational age

Gestational age	Serum calcium Before phototherapy	Serum calcium after phototherapy
28-36 weeks	9.33 ± 1.03	8.78 ± 1.22
≥37 weeks	9.60 ± 0.86	9.13 ± 1.10

Table 4: Comparison of decrease in Calcium with weight of neonates (n= 100) p-value - 0.4

Weight	Neonates with Decrease in serum calcium	Neonates with n normal serum calcium	Total
<2.5 kgs	28	3	31
>2.5 kgs	58	11	69
	86	14	100

Table 5: Comparison of decrease in calcium with age of presentation of neonates (n=100)

Age of presentation	Neonates with Decrease of serum calcium	Neonates with normal calcium	Total
<3 days	49	8	7
>3days	37	6	43
	86	14	100

Table 6: Neonates developing Hypocalcemia Post phototherapy

	No. of cases	%
Hypocalcemia	5/ 100	5%
Symptomatic hypocalcemia	3/5	3%

DISCUSSION:

Phototherapy is an independent risk factor for hypocalcemia. Phototherapy is a safe way of treating neonatal jaundice but has some side effects like skin burn, diarrhea, hyperthermia, fluid loss, retinitis, thrombocytopenia, bronze baby syndrome. One of the important side effects but in fact a complication of phototherapy is hypocalcemia.

In our study, decreased calcium levels in 86 % (n=86) neonates were seen, hypocalcemic range in 5 % (n=5) neonates. Out of 5, three were having symptomatic hypocalcemia.

Decrease in calcium was not related to gestational age of newborn, weight of neonates, age of presentation and sex of newborn.

In our study, most common symptoms suggestive of hypocalcemia is irritability. With all 3 hypocalcemic neonates being irritable (100%) and one having jitteriness (33.33%). None of the babies developed hypocalcemic seizures.

Phototherapy in our study decreases the calcium levels and symptomatic cases of hypocalcemia were seen in 3% cases. As initial symptoms of hypocalcemia may be missed, baby under phototherapy should be monitored closely for signs and symptoms of hypocalcemia.

CONCLUSION:

Hypocalcemia is an important complication in neonates with unconjugated hyperbilirubinemia after continuous phototherapy. Hypocalcemia has clinical impact and adds to morbidity and if left untreated, can lead to mortality.

Hypocalcemia leads to apnea, convulsion, muscle cramps, tremor, tetanus and increased mortality rate.

Therefore, it should be timely diagnosed by monitoring serum calcium level in neonates receiving phototherapy and appropriately treated with intravenous 10% calcium gluconate along with calcium supplementation.

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