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"STUDY OF PHOTOTHERAPY INDUCED HYPOCALCEMIA AND ITS CORRELATION WITH URINARY CALCIUM EXCRETION"

Paediatrics

Dr.Devjibhai k vadher	(assistant professor in department of pediatric)
Dr.Mehul S dhanki	(resident in pediatric department)
Dr.Mehul D Sindha	(resident in pediatric department)
Dr.Jaydip D Darji	(resident in pediatric department).
Dr.kamleshkumar G Rathod	(assistant professor in pediatric department)

KEYWORDS:

INTRODUCTION:
Hyperbilirubinemia is most common benign conditions that occurred in Newborn with in first week of life. 60% of term and 80 % of preterm newborn develop Hyperbilirubinemia with in first week of life. 5- 10 % have my required intervention and treatment. It is the cause of concern for the physician and a source of anxiety for parents. Neonatal Hyperbilirubinemia mostly due to the unconjugated Hyperb ilirubinemia but some time it may be direct Hyperb ilirub inemia. High level of unconjugated bilirubin level toxic to developing central nervous system and may lead to serious brain damage.

Normal adult Serum bilirubin <2 mg/dl. Adult appear jaundiced when serum bilirubin level > 2mg/dl. Newborn appear Jaundiced when serum bilirubin level > 7mg/dl.

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AIM & OBJECTIVE:

Primary objective:
1) To Study phototherapy induce hypocalcemia that develop after 48 hr of phototherapy or at the end of phototherapy in new born with Hyperbilirubinemia.
2) Also study the phototherapy effect on urinary calcium level and its correlation with hypocalcemia.

Secondary objective:
1) Hypocalcemia incidence in preterm and full term,
2) hypocalcemia and its relation with intensity of phototherapy,
3) Symptom that develop in baby of phototherapy induce hypocalcemia.

MATERIAL AND METHODS: This study was conducted at C.U.Shah medical hospital – A tertiary care center providing intensive pediatric care at surendranagar, Gujarat. This hospital is 100 bedded tertiary care hospital providing intensive pediatric and neonatal care with different subspecialty care. Drainage of hospital is wide include population of surendranagar city with areas near surendranagar.

This prospective case control study was conducted in 100 newborn admitted with hyperbilirubinemia in Nicu cu shah medical college during period of July 2016 to dec 2017.

Sample size: Sample size is 100.
Inclusion criteria: 1) Preterm and Full-term New-born with Hyperbilirubinemia with in day of life 2nd to 14 day.

2) New-born required Phototherapy.

Exclusion criteria: 1) New-born presented with Hyperbilirubinemia within 24 hr.
2) Newborn presented with Hyperbilirubinemia > 14 day of life.
3) Newborn with sepsis.
4) Newborn required Exchange transfusion.
5) Newborn fed with cow milk.
6) Newborn has Hypocalcemia before phototherapy

RESULT:
1) Of 490 babies delivered in Gynec department of CUSMC during period of July 2015 to Dec 2016: 20% (n=100/490) develop Hyperbilirubinemia. So incidence of Hyperbilirubinemia is 20% in our hospital.
2) Out of 100 babies who develop Hyperbilirubinemia 60% male (n=60/100) & 40% female (n=40/100).
3) Among them 62% (n=62/100) full term babies and 38% (n=38/100) preterm babies.
4) Babies Develop bilirubin on
   day 2 : 14% (n= 14/100)
   day 3: 25 % (n=25/100),
   day 4 : 39% (n-39/100)
   day 5: 22% (n=22/100).
   day 6: 3 %(n=3/100)
   day 7: 1 %(1/100)
5) Mean serum bilirubin level pre phototherapy for FT : 17.17±2.977
   Mean serum bilirubin level pre phototherapy for PT :14.32±2.12
   Mean serum calcium level pre phototherapy for FT : 8.92±0.474
   Mean serum calcium level pre phototherapy For PT : 7.85±0.450
   Mean urinary calcium /creatinine ratio for FT : 0.59±0.104.
   Mean urinary calcium /creatinine ratio for PT : 0.59±0.098
   Mean weight of baby : 2500±550gm.
6) Patient required phototherapy SSPT 66% (n=66/100) and required DSPT was 34% (N=34/100).
7) Babies required phototherapy for 48 hour.
8) After 48 hour of phototherapy 62% (n=62/100)baby develop hypocalcemia:
   Mean serum calcium level for full term after phototherapy: 8.14± 0.561.
   Mean serum calcium level for pre-term after phototherapy: 6.84±0.323

Table 1: No of patient develop hypocalcemia.

Maturity	No	%
FT	28	45%
PT	34	55%
Total	62	100%

FT babies serum calcium level comparison before and after phototherapy

Table 2: serum calcium level before and after phototherapy in FT babies.

Serum calcium level	At the 0 hr	At 48 hr after phototherapy
< 8 mg/dl	0 (0%)	28(45%)
8-9 mg/dl	40(65%)	22(35%)
>9 mg /dl	22(35%)	12(20%)
Mean value	8.92±0.474	8.14±0.561
Paired t test	**T Value: 14.92,DF:61**	**P value<0.001**

P value <0.05 so study suggest serum calcium level significant drop down. Phototherapy lead to hypocalcemia in full term baby.

Table 3: serum calcium level before and after phototherapy in PT babies.

Serum calcium level	At the 0 hr	At the 48 hr
<7mg/dl	0(0%)	34(90%)
7-8mg/dl	28(74%)	3 (7.5%)
>8mg/dl	10(26%)	1(2.5%)
Mean	7.85±0.450	6.84±0.323
Paired t test	**T value: 14.049. DF: 37**	**P value:<0.001**

P value < 0.05 so phototherapy lead to hypocalcemia in preterm baby.

9) So according to study 28 full term babies out of 62 develop hypocalcemia so incidence of phototherapy induced hypocalcemia in full term babies is 45% (n=28/62)

10) Also according to study 34 preterm babies develop hypocalcemia out of 38 so incidence of hypocalcemia in pre-term babies is 90% (n=34/38).

11) 34 Babies who received double surface phototherapy (DSPT) out of them 26(76%) babies develop hypocalcemia. while 66 babies who receive single surface phototherapy (SSPT) out of them 36 (54%) babies develop hypocalcemia.

12) Phototherapy also lead to increased Urinary calcium excretion that was determined by urinary calcium/ creatinine ratio:
Mean urinary ca/cr ratio before phototherapy in full term babies is: 0.59±0.104
Mean urinary ca/cr ratio after phototherapy in full term babies is: 0.8±0.149

Table 4: Urinary calcium creat ratio in full term baby before and after phototherapy.

Urinary calcium/creatinine ratio	At 0 hr before phototherapy	At 48 hr after phototherapy
0.45-0.65	48(77%)	14(23%)
0.65-0.85	14(23%)	5(8%)
>0.85	0(0%)	43(69%)
Mean	0.59±0.104	0.8±0.149
Paired t test	**T value: -10.201 DF:61**	**P value:<0.001**

Comparison of urinary ca/cr ratio in preterm babies:

Mean urinary ca/cr ratio in preterm babies before phototherapy is: 0.59±0.098
Mean urinary ca/cr ratio in preterm babies after phototherapy is: 0.71±0.154

TABLE NO 5: Urinary calcium/creat ratio in pre-term baby before and after phototherapy.

Urinary calcium/creatinine ratio	At 0 hr before phototherapy	At 48 hr after phototherapy
0.45-0.65	28(74%)	14(37%)
0.65-0.85	10(26%)	13(34%)
>0.85	0(0%)	11(29%)
Mean	0.59±0.098	0.71±0.154
Paired t test	**T value:-4.402, DF:37**	**P value:<0.05**

Incidence of phototherapy lead to increased urinary calcium excretion in full term is 69% and in preterm is 29%,

13) 54(54%) babies have increase urinary calcium excretion out of them only 21(39%) babies have hypocalcaemia.
Out of 43 full term babies have increased urinary calcium excretion only 11 have develop hypocalcemia.

Out of 11 pre-term babies have increased urinary calcium excretion 10 babies have develop hypocalcemia So study suggest that phototherapy lead to hypocalcemia also lead to increased urinary calcium excretion. So hypocalcemia may be due to increased calcium excretion.

14) Out of 62 babies develop hypocalcemia 45 babies (72%) babies become symptomatic. And other 17 babies (28%) remain asymptomatic

15) Out of 28 full term babies who develop hypocalcemia 20(70%) babies become symptomatic. 10(50%) babies develop jitteriness, 5(25%) babies become lethargic, and 5(25%) babies become irritability.

16) Out of 34 preterm babies that develop hypocalcemia: 25(74%) become symptomatic. 12(48%) babies develop jitteriness, 6(24%) babies become irritable, and 7 (28%) babies become lethargic.

So it suggest that out of 45 babies who become symptomatic 22 babies (49%) develop jitteriness. So jitteriness is the common symptom of phototherapy induced hypocalcemia.

DISCUSSION:

HAKINSON AND HUNTER: say that phototherapy lead to decrease pineal gland melatonin secretion which block the effect of cortisol on bone calcium. So cortisol lead to increased bone uptake of calcium lead to hypocalcaemia.

Kim: suggested phototherapy lead to decrease level of parathyroid hormone so it lead to hypocalcaemia.

In ASI study there is significant high calcium excretion in urine after phototherapy but they not found significant serum calcium level difference. There is decreased calcium level but not that much.so they said phototherapy lead to increase urine calcium excretion but that not lead to hypocalcemia.

In our study: 54 babies who have increased urine calcium level after phototherapy out of 21(37%) babies have hypocalcemia. 11 (52%) full term and 10(48%) pre-term babies have high urinary calcium excretion have hypocalcemia. P value is < 0.05 statically significant it show that phototherapy induce hypocalcemia and increased urinary calcium excretion is correlated.

So study suggest that phototherapy lead to hypocalcemia also lead to increased urinary calcium excretion. So hypocalcemia may be due to increased calcium excretion.

Hooman: study suggest that urine calcium excretion was increased in baby who treated with phototherapy.

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