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COMPARATIVE STUDY OF SINGLE SURFACE AND DOUBLE SURFACE PHOTOTHERAPY IN NEONATAL HYPERBILIRUBINEMIA

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Abstract- *Neonatal jaundice occurs in about 60% of full-term neonates and in about 80% of preterm neonates. A significant proportion of causes of hyperbilirubinemia in the term newborn are benign and reversible. However, considering the potentially irreversible toxicity of bilirubin on the central nervous system (kernicterus), newborns must be evaluated to identify which ones will need treatment.It is a result of the increased breakdown of RBC and/or decreased hepatic excretion of bilirubin. Generally NNH is a natural transition that resolves within the 1st week of life with liver maturity. Since the 1950s, phototherapy has been the therapy of choice for the newborn with indirect hyperbilirubinemia· Single phototherapy (SP) is the most commonly used method, and, when bilirubin levels are close to the threshold for exchange transfusion, intensive phototherapy is indicated[6]. To study and compare the rate of fall of Total Serum Bilirubin levels in neonatal hyperbilirubinemia treated with Single Surface Phototherapy and Double Surface Phototherapy. Neonates in NICU and in Postnatal wards, who are clinically icteric, will be enrolled in the study after written informed consent from the parents(Annexure 1). Data will be collected in a pre-decided proforma(Annexure 2). Details will be obtained from direct questioning of the mother and examination of the newborn and his record. Repeat bilirubin levels will be estimated as per the protocols and requirements of the NICU. Phototherapy will be stopped in accordance with the protocols followed in NICU. The rate of fall of serum bilirubin levels will be observed in both the types of phototherapy given to determine if there is any difference in the effectiveness of SSPT vs DSPT. DSPT is more effective than SSPT. Conclusions of the study will be based on the results of the study.*

Keywords: *neonatal hyperbilirubinemia, hyperbilirubinemia, single surface phototherapy, double surface phototherapy, NICU admissions, comparative study, rate of fall of serum bilirubin, hyperbilirubinemia, single surface phototherapy, double surface phototherapy, NICU admissions, comparative study.*

I. Introduction

Neonatal jaundice occurs in about 60% of full-term neonates and in about 80% of preterm neonates[1]. Bilirubin is derived front the breakdown of heme containing proteins in the reticuloendothelial system. The daily production

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of bilirubin in a normal newborn is 6 to 10 mg/kg/day. A significant proportion of causes of hyperbilirubinemia in the term newborn are benign and reversible[2]. However, considering the potentially irreversible toxicity of bilirubin on the central nervous system (kernicterus), newborns must be evaluated to identify which ones will need treatment[3].It is a result of the increased breakdown of RBC and/or decreased hepatic excretion of bilirubin. Generally NNH is a natural transition that resolves within the 1st week of life with liver maturity. Since the 1950s, phototherapy has been the therapy of choice for the newborn with indirect hyperbilirubinemia [4,5.] Single phototherapy (SP) is the most commonly used method, and, when bilirubin levels are close to the threshold for exchange transfusion, intensive phototherapy is indicated[6]

The most common therapeutic modalities in the treatment of NNH are:

1. Phototherapy
2. Exchange transfusion
3. Intravenous immune globulin.
4. Bilirubin molecules in light-exposed skin undergo quick photochemical reactions:
5. configurational isomerization,
6. structural isomerization,
7. photooxidation

The size of exposed BSA + level of irradiance, determines the **spectral power** of phototherapy, which in turn influences its effectiveness. The larger the exposed BSA and stronger. the light, the higher the spectral power.

Irradiance: Minimum level of 30microW/cm2/nm in wavelength range of 460 to 490nm must be ensured

The possible adverse effects associated with phototherapy are: skin rash, increased insensible losses, retinal damage, hyperthermia, and deposition alterations due to increased intestinal flow[7,8]

Background/rationale: Proper studies were not available to compare the effectiveness of SSPT and DSPT in NNH.

Objectives: To study and compare the rate of fall of Total Serum Bilirubin levels in neonatal hyperbilirubinemia treated with SSPT and DSPT.

Methods:

Study design*:* Prospective observational study of neonates admitted in NICU with hyperbilirubinemia.

Setting: The AVBRH, Sawangi is a rural Medical College located in Maharashtra. This study will be conducted in the NICU and Postnatal ward, Department of PEDIATRICS in Jawaharlal Nehru Medical College &Acharya Vinoba Bhave Rural Hospital, Wardha for a period of 2 years.

Participants

Inclusion Criteri

- All neonates admitted in NICU for treatment of neonatal hyperbilirubinemia requiring phototherapy.

Exclusion Criteria

- Parents denied consent.
- Neonates with hyperbilirubinemia in exchange transfusion range.

Variables: gestational age of the child(term/,gender, risk factors, co morbidities,

Data sources/ measurement- To **study** the rate of fall of Total Serum Bilirubin levels in NNH treated with SSPT and DSPT

- To **compare** the rate of fall of TSB levels in NNH treated with SSPT and DSPT

Study size: Population size (for finite population)

Sample size(n):**73**

Quantitative variables*:* Rate of fall of TSB levels in NNH treated with SSPT and DSPT.

Statistical methods: The data will be entered in Microsoft Excel sheet. The quantitative data analysis will be done using Student t-test and qualitative data will be analysed using Chi-square test. The p-value of <0.5 will be considered significant.

Expected Outcomes/Results

DSPT is more effective than SSPT is expected according to previous similar studies. All neonates admitted in NICU for treatment of neonatal hyperbilirubinemia requiring phototherapy. Irrespective of gestational age, gender, co morbid conditions, risk factors of mother and baby, all neonates with hyperbilirubinemia will be taken into the study.

II. Discussion

Many studies have demonstrated significant reduction of bilirubin level by using double phototherapy compared with single phototherapy, but the irradiance of phototherapy is lower than recommendation of AAP, and some trials studied in low birth weight infants [9,10] The efficacy of phototherapy is dependent on the colour (wavelength), intensity (irradiance) of the light emitted during phototherapy, the exposed body surface area and the infant's distance from the light [11,12]. In phototherapy treatment of term newborns with significant hyperbilirubinemia, double phototherapy provided more rapid and effective bilirubin reduction than conventional phototherapy alone due to higher spectral irradiance and larger body surface area exposed to phototherapy [13.] The use of phototherapy has decreased the need for exchange transfusion in term and preterm infants with haemolytic and nonhemolytic jaundice [14]. Intensive phototherapy may eliminate the need for exchange transfusion [15]. A number of other related articles in this region were reviewed [16-67] .

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