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USE OF EARLY NASAL CONTINUOUS POSITIVE AIRWAY PRESSURE IN PRETERM NEONATES WITH HYALINE MEMBRANE DISEASE

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ABSTRACT **Background & Objective:** Mechanical ventilation is the standard treatment for hyaline membrane disease (HMD) and has increased neonatal survival. However this increased survival has come at the expense of increased morbidity in the form of chronic lung disease, longer duration of hospitals stay and at the cost of expensive technology. Alternate form of respiratory support is early nasal CPAP. Hence present study aims at managing increasing number of preterm babies with HMD with a non-invasive approach in the form of early nasal CPAP. **Methods:** 50 babies of 28-34 weeks gestational age admitted in neonatal ICU of pediatrics Department at Patna Medical collage & hospital, Patna with clinical diagnosis of HMD, requiring respiratory support were treated with early nasal CPAP and studied prospectively from 01.12.2019 to 30.11.2020. **Statistical analysis:** Chi-square and other appropriate tests. **Results:** We found a success rate of 80% in babies with HMD, who were managed with early nasal CPAP alone. Remaining 20% needed intubation and higher mode of ventilation. Mild and moderate grade HMD were effectively managed with early nasal CPAP ($P<0.05$). It was also found to be effective in babies of mothers who have received antenatal steroids ($P<0.05$). **Conclusion:** Prematurity is the commonest predisposing cause for HMD. Early nasal CPAP is safe, inexpensive and effective means of respiratory support in HMD. it is useful in mild and moderate grade disease. It may not be a replacement for assisted ventilation in severe disease. It is also found to be effective in babies of mothers who have received antenatal steroids.

KEYWORDS :

INTRODUCTION

Neonatal respiratory distress syndrome (neonatal RDS), previously called hyaline membrane disease, is a developmental disorder of mainly preterm infants. Structural immaturity of the lungs surfactant deficiency and surfactant dysfunction are main problems of preterm newborns, leading to respiratory distress. Despite of new preventive strategies, neonatal RDS is still the leading causes of mortality and morbidity in neonatal intensive care.

Respiratory distress syndrome (RDS) is the single most important cause of morbidity and mortality in infants. According to the year 2002-03 report of National Neonatal Perinatal Database (NNPD) involving 151436 intramural deliveries, the incidence of RDS in our country was 1.3% of all live births and it was the primary cause of death in 13.5%. The incidence of RDS is inversely related to gestational age. In babies born at 28-32 weeks, RDS occurs in up to 50% of live births.

Intermittent positive pressure ventilation (IPPV) with surfactant is the standard treatment for RDS. Initial attempts at artificial ventilation were done with negative pressure ventilators and subsequently with intermittent positive pressure ventilators. In 1960s, mechanical intermittent positive pressure ventilation became widely accepted as therapy for RDS, in all series mortality was high when infants were less than 1500 grams or required ventilation before 24 hours of age.

Therefore, another method for improving oxygenation in infants with RDS was sought and in 1971 Gregory et al used continuous positive airway pressure (CPAP) in the treatment of idiopathic respiratory distress syndrome. It was thought that application of CPAP might overcome atelectasis and improve arterial oxygenation. The effect of grunting respiration on arterial oxygenation also suggested that CPAP might be useful. Infants who grunt exhale against a partially closed glottis which increases transpulmonary pressure and probably decreases or prevents atelectasis. If grunting is prevented by insertion of endotracheal tube, arterial oxygen tension (PaO2) decreases; however when tube is removed and grunting is resumed PaO2 rises again.

This was welcomed as a missing link between the oxygen and ventilator therapy with great enthusiasm.

The major difficulty with IPPV is that it is invasive and contributes to airway and lung injury including the development of chronic lung disease.

The advent of less invasive CPAP has permitted early treatment of RDS in neonates with aims to intervene as early as possible and to avoid intubation and reduced mucociliary flow and risk of mucosal injury or secondary infection and to minimize volutrauma to the airways and lung parenchyma. In 1976 Wung et al stated that "introduction of continuous distending pressure (CDP) was a major breakthrough and remained an important modality of Treatment in RDS". This view was supported by number of studies which indicate that early intervention with CDP might modify the course of illness and lower the need for more aggressive therapy.

Present study is a hospital based study and aims at managing increased number of babies with hyaline membrane disease with a non-invasive approach in the form of early nasal CPAP.

OBJECTIVES

1. To find the incidence of premature neonates (less than 37 weeks) in our hospital.
2. To find the incidence of hyaline membrane disease in premature neonates with gestational age between 28-34 weeks.
3. To evaluate the effectiveness of early nasal CPAP in these premature neonates with hyaline membrane disease.

MATERIALAND METHODS

50 cases of clinically diagnosed HMD with gestational age between 28-37 weeks admitted to Neonatal ICU were subjects of this study. These babies requiring respiratory support were treated with early nasal CPAP (within 6 hours of onset of respiratory distress) and studied prospectively from December 2019 to November 202020. The period of collection of data was one year.

Design of the study: Hospital based observational study. Duration of the study: One year(12 months) i.e., from December 2019 to November 2020.

Inclusion criteria for cases: All preterm neonates born in our hospital with gestational age between 28-34 weeks with diagnosed HMD after taking consent from parents/ guardians.

Exclusion Criteria for cases:

1. All term neonates
2. Neonates with congenital malformations.
3. Babies born to mothers receiving general anesthesia, phenobarbitone, pethidine and other drugs likely to depress the baby .
4. Preterms borne outside our hospital
5. Babies with meconium aspiration syndrome.
6. Babies with birth asphyxia.

Method of collection of data: 50 babies with gestational age between 28-34 weeks admitted with clinical diagnosis of HMD requiring respiratory support were treated with early nasal CPAP (within 6 hours of onset of respiratory distress) and studied prospectively from December 2019 to November 2020.

All babies with HMD were evaluated using SA scoring, blood gas analysis and pulse oximetry. Babies with SA score of >4 or requiring FiO2 >0.4 to maintain PaO2 above 50-60 mm Hg were treated with early nasal CPAP and effectiveness was judged using SA scoring and blood gas analysis. If symptoms progress and FiO2 requirement is >0.6 to maintain SpO2 above 85%, babies were ventilated.

Method of Statistical Analysis: After the completion of the study, data was analyzed using appropriate statistical methods to find out the effectiveness of early nasal CPAP in the treatment of preterm infants with HMD.

Babies treated with nasal CPAP treatment were classified into two groups namely success and failure group and comparison between the groups were carried out as follows:

1. Proportions were compared using chi- square (c) test of significance. Proportion of cases belonging to specific group of parameter or having a particular problems were expressed in absolute numbers and percentages.
2. The results were averaged (mean+/- standard deviation) for each parameter (duration of treatment, age at admission, age at treatment and ABG parameter) between the groups. Student's 't' test were used to find a significant difference between two means.

In all above test, "p' value of less than 0.05 was accepted as indicating statistical significance.

RESULTS

Total number of deliveries - 3550

Total number of preterm neonates (37 weeks) - 443

Incidence of preterm neonates - 12.47%

Total number of diagnosed HMD cases between 28-34 wks - 114

Incidence of HMD in neonates with gestational age between 28-34 weeks - 3.2%

50 babies admitted with clinical diagnosis of HMD requiring respiratory support were treated with early nasal CPAP and studied prospectively from December 2019 to November 2020. Out of total 50 babies who were managed with nasal CPAP, it proved effective in 40 babies (80%), remaining 10 babies (20%) had to be intubated and required ventilation.

CONCLUSION

1. Prematurity is the commonest predisposing factor for HMD. Its incidence increases as gestational age decreases.
2. Early nasal CPAP is useful in mild and moderate grade HMD. It may not be a replacement for assisted respiratory support (ventilation) in severe HMD.
3. Nasal CPAP is found to be effective in babies of mothers who had received "antenatal steroids.
4. Nasal CPAP is safe, inexpensive and effective means of respiratory support in HMD.

In developing countries like ours, there is high burden of prematurity and sub-optimal use of antenatal steroid administration resulting in frequent HMD. Use of early nasal CPAP which is simple, non-invasive, has low cost outlay and does not require much expertise, is the option for us where most places cannot provide invasive ventilation.

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