A Comparative Study of Nasal Masks and Nasal Prongs with Regard to the Incidence of Nasal Septal Necrosis in Neonates Who are Experiencing Respiratory Distress for the Purpose of Administering Nasal Continuous Positive Airway Pressure

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ABSTRACT

Within the framework of respiratory distress syndrome (RDS), the therapy of the affected individual condition necessitates the utilization of Mechanical ventilation and oxygen treatment are both options. Both the development of bronchopulmonary dysplasia and the prevention of airway damage can be achieved with the utilization of continuous positive airway pressure, often known as CPAP, which is as follows: respiratory support method that is straightforward, economical, and of non-invasive nature. The objectives of In neonates diagnosed with respiratory distress syndrome and receiving nasal continuous positive airway pressure, the purpose of the study was to describe the comparison of nasal septum necrosis and to determine the degree of damage to the nasal septum. (nCPAP) with nasal prongs or nasal masks. The Components and Procedures: An experiment that was prospective and randomised was conducted on two hundred newborns who were admitted to the neonatal intensive care unit (NICU). In order to provide these newborns with an interface for non-compliant continuous positive airway pressure (nCPAP), they were randomly randomized to receive either a nasal mask or a nasal prong during their treatment. A blood culture, a complete blood count, a measurement of C-reactive protein, and a chest X-ray were all diagnostic procedures that were carried out. Each newborn was monitored over a period of seventy-two hours to determine whether or not nasal septal necrosis had developed in each interface. With the assistance of the Chi-square test, each and every variable was evaluated. Results showed that out of the total of 200 neonates who were enrolled in the trial, nine percent of the prong group acquired nasal septum necrosis. On the other hand, the mask group did not have any instances of septum necrosis noticed. It was determined that nasal masks were superior than nasal prongs in terms of effectiveness, since the only group of infants who experienced nasal septum injuries was the group that used the nasal prongs.

***Keywords*:** *Nasal mask, nasal prong, nasal continuous positive airway pressure, and respiratory distress are all examples of nasal devices.*

INTRODUCTION

In preterm babies, respiratory distress syndrome (RDS) is the most common cause of respiratory distress syndrome (RD), also known as respiratory distress syndrome. RDS, In addition to being referred to as hyaline membrane disease (HMD), it is the leading cause of illness and mortality in the United States. the early newborn period. It is also the most common cause of pulmonary surfactant deficiency, which leads to the development of RDS. It has been found that the incidence of RD has a relationship that is inversely proportional to the

pregnancies of the mother. Among neonates that were born prematurely and had a gestational age of fewer than 28 weeks, this is responsible for about 80 percent of the occurrence. It is essential for infants to get respiratory assistance When being treated at the neonatal intensive care unit (NICU) in order to address respiratory distress syndrome (RD).

Oxygen treatment, positive-pressure ventilation (PPV), and surfactant therapy are the three methods that are utilized when it comes to the treatment of infants who are suffering from respiratory distress syndrome (RD). One of the most common treatments for RD is PPV combined with surfactant therapy. Nevertheless, one of the most significant drawbacks of PPV is that it is an intrusive operation that might result in harm to the airway and the lungs. When neonates with surfactant deficit are treated with PPV, there is a possibility that they could have problems with their airways and lungs, which might ultimately result in the development of bronchopulmonary dysplasia. Therefore, even newborns who survive and are treated with mechanical ventilation have the potential to acquire chronic lung disease for themselves. In order to prevent the potentially negative consequences of mechanical breathing, In the medical field, continuous positive airway pressure, more commonly referred to as CPAP, is a non-invasive breathing assistance that involvesfavoredin today's society. In order to facilitate the utilization of nasal continuous positive airway pressure (nCPAP), the fact that newborns breathe mostly through their noses. In babies, Continuous positive airway pressure, sometimes known as CPAP, is beneficial because it preserving functional residual capacity, which prevents atelectasis and allows for gas exchange. The only newborns that are able to receive CPAP are those who have spontaneous respiration. When it comes to infants, nasal trauma is the most common source of discomfort, and it can also lead to cosmetic sequelae. This occurs during the (nCPAP) stands for non-continuous positive airway pressure, which is administered.

Using nasal prongs and nasal masks for nasal continuous positive airway pressure (n CPAP), the purpose of this study was to analyze the comparison of nasal septum necrosis and to define the degree of nasal septum damage in neonates with respiratory distress syndrome. The investigation was conducted in order to determine the degree of nasal septum damage.

MATERIALSANDMETHODS

After receiving clearance this prospective randomized controlled experiment was carried out over the course of eleven months in the year 2017, according to the Institutional Ethics Committee on Human Research at the tertiary care hospital in Vadodara, Gujarat. The trial was conducted in the level 3 Neonatal Intensive Care Unit (NICU) of the hospital pediatric department. For the purpose of this study, a total of two hundred newborns who had been hospitalized NICU, which stands for the newborn intensive care unitwere selected. With the parents' written assent, an informed consent was obtained. The presence of any two of the following characteristics was shown to be indicative of respiratory distress syndrome (RDS): tachypnea (respiratory rate equal to or greater than sixty), The patient is experiencing hemodynamic instability, intercostal and sternal retractions, and an expiratory grunt. The neonates that were included in the study were preterm neonates, both early and late, who were between 28 and 36 weeks of gestation and had patients diagnosed with respiratory distress syndrome (RDS) with a score of six or higher, infants born with a very low birth weight, and score of less than 1.5 kilograms and RDS with a score of 6 or higher, premature apnea, transitory tachypnea of the infant, and apnea of prematurity infants who were undergoing a post-extubating trial transitioning from prolonged mechanical ventilation to non-continuous pulmonary airway pressure (nCPAP) as a respiratory support.

Those preterm newborns who were born with substantial congenital deformities, conditions such as tracheoesophageal fistula, congenital lung abnormalities, and congenital diaphragmatic hernia are examples of congenital conditionswere not included in the research. Babies who had been diagnosed with congenital heart disease or had been diagnosed with it prior to birth, babies whose parent individuals who had previously been receiving non-continuous and continuous positive airway pressure were referred to the hospital because they refused to grant their permission (nCPAP) outside of patients who required intubation at birth were not included in the study. patients who were admitted to the hospital and were referred with complications associated to it were not included in the study.

In each and every instance, a comprehensive prenatal, natal, and postnatal history was gathered, and then general and systemic exams of newborns were carried out upon them. Neonatal patients who met the in the beginning, the criteria for inclusion were established in the triage area of the delivery room, and thereafter they were transferred the newborn intensive care unit, sometimes known as the NICU. Randomization was utilized in order to ascertain if the nasal mask or nasal prongs will be utilized as the way of CPAP delivery interface for the infants who were enrolled. A randomization chit that was created by a computer was used in conjunction with opaque envelopes that were sealed and consecutively numbered. These envelopes were stored surrounded by the neonatal intensive care unit (NICU) in the vicinity of the clock. The physician who was on duty unsealed opaque envelopes that had been consecutively numbered and sealed, and then then randomly assigned newborns to the appropriate group.

In order to determine the underlying cause of RD, clinical, laboratory, and radiographic criteria were utilized in the diagnostic process. The Silverman Anderson Scoring, which was used for preterm babies, and Downe's Score, which was used for term neonates, were both applied in the evaluation of RD. The time at which RD symptoms first appeared was documented. Following that, regular examinations were carried out, which included a blood count and completeness, monitoring for C-reactive protein enzyme, as well as the culture of blood and its sensitivity testing. Prior to the administration of bubble CPAP, chestXrays were performed. newborns were monitored for a period of seventy-two hours in order to identify the occurrence of local problems, such as to determine the severity of nasal necrosis, as well as to categorize the nasal septum necrosis that was associated with each interface nasal mask and nasal prong that was utilized for the purpose of administering non-continuous positive airway pressure (nCPAP) in patients when newborns with RD. The categorization of nasal trauma was determined by using the categorization of decubitus lesions according to a standardised system that was developed via the efforts of the National Pressure Ulcer Advisory Panel in the United States.

• Stage 1: Erythema that does not blanch is present on skin that is Otherwise, it is unharmed.

• Stage 2: A superficial ulcer or erosion, with a loss of skin thickness and partial thickness.

• Stage 3: There occurs necrosis, and the skin is lost in its entirety.

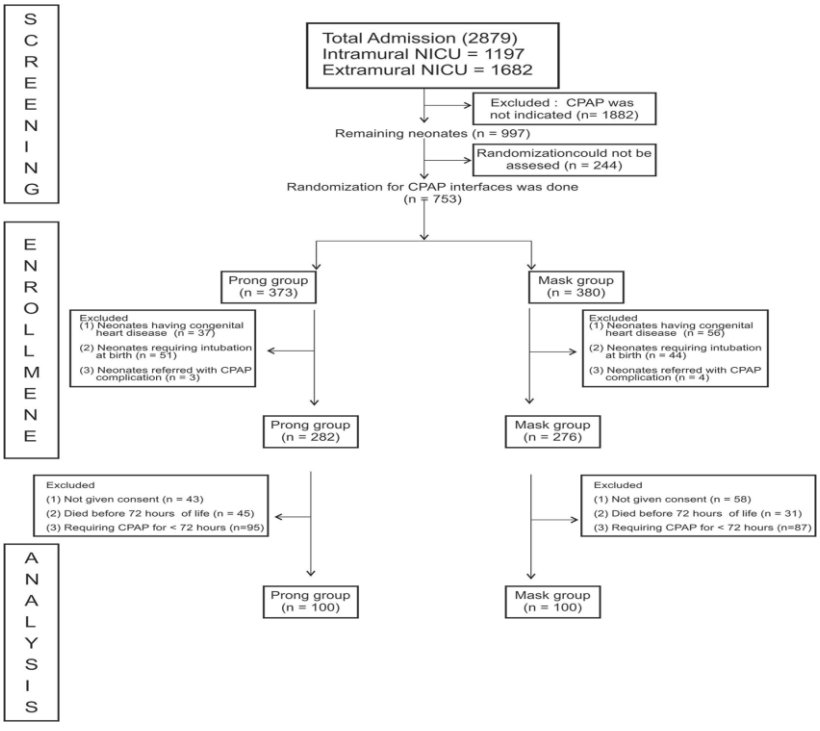

Figure1:Flowchartdescribingthemethodofscreeningandanalysis

RESULTS

There was a total of 997 newborns who required This study was conducted in the neonatal intensive care unit (NICU) throughout the course of time using continuous positive airway pressure (CPAP) the trial, which lasted for eleven months. According to the sample size, which is seen in Figure 1, a total of two hundred neonates individuals who fulfilled the inclusion criteria described earlier were recruited and enrolled. After making certain that the randomization was carried out correctly, one hundred newborns were included in each interface, nasal mask, and nasal prong that was used respectively. The numerous signs of positive airway pressure that is maintained continuously included in Table 1, which illustrates the distribution of these symptoms in both sites.

Based on the findings shown in Table 2, the male to female ratio in both arms of the current investigation was about three to two. To far, there have been a total of babies diagnosed with nasal septal necrosisdisplayed in Table 3. This table also reveals that 9% of the neonates who were exposed to nasal prongs nasal septal necrosis was established as an interface, however none of the neonates had any of these symptoms. who were exposed to nasal masks got this condition. It was shown that neither the gestational age nor the birth weight had any influence on the development of septal necrosis in either of the two groups.

Table 1: Distribution of various indications of continuous positiveairwaypressure in boththeinterfaces

Septalnecrosis	**Numberofpatients(n=200)**	
Prongsgroup(n=100)		**Maskgroup(n=100)**
Yes	08	1
No	92	99
Total	100	100

p=0.0064

Table2:Demographicdistributioninboththeinterfaces

Demographicaldata	**Nasalprongs(n=100)**	**Nasalmasks(n=100)**
Genderdistribution		
Male	64	61
Female	36	39
Gestationalagedistribution(weeks)		
≤27	1	3
28–32	55	50
33–36	40	36
≥37	5	11
Birthweightdistribution(g)		
≤1000	8	12
1001–1499	49	38
1500–1999	31	38
2000–2499	6	5
2500–2999	3	5
≥3000	3	2

Table3:Distributionofseptalnecrosismeasuresinbothinterfaces

Etiology	**Numberofpatients(n=200)**	
	Prongsgroup(n=100)	**Maskgroup(n=100)**

HMDGrade1	42	29
HMDGrade2	36	45
HMDGrade3	1	3
Transienttachypneaofnewborn	11	5
Recurrent apnea	3	2
Congenital pneumonia	3	6
Meconiumaspirationsyndrome	0	1
Post-extubation	4	9

HMD:Hyalinemembranedisease

DISCUSSION

Acute lung disease (HMD), which is the pathologic correlate of condition marked by respiratory discomfort in newborns, is the most common cause of acute lung illness in children born prematurely, and it is also the most common cause; mostly caused by insufficient quantities of surfactant exposure. At the same time as the incidence of RDS has a negative correlation with the gestational age of the mother is directly proportional to the degree of preterm that the baby was born at. In most cases, this gets worse throughout the first 48–72 hours, although it gets better when therapy is administered. As a result of the pressure exerted by the sensors that are located on the nasal septum, the cutaneous fragility of the septum, and morphological variables include the terminal vascularization of the columella and the nostrils, among other examples septum necrosis can develop in babies who are receiving pressure that is applied continuously to the airway (CPAP). The frequency the prongs group was found to have a considerably higher incidence of nasal septum necrosis than the other group. compared to the masks group in our research ($p = 0.0064$). There was a difference that might be considered Across the two groups in terms of the prevalence of, statistically significant differences were found between local nasal problems. The nasal mask group may have fewer nasal difficulties than the other group because the mask is easier to apply, it is softer, and it is designed differently.

According to the findings of a research that was carried out by Goel and colleagues, when compared to the group that used prongs, the group that used masks had a significantly reduced incidence of total nasal injuries. ($p=0.02$). In a similar vein, Kieran and colleagues came to the conclusion that a nasal mask should be used instead of prongs, and their findings were statistically significant. Following the completion of a comprehensive study and meta-analysis, Jasani and colleagues came to the conclusion that a nasal mask was a risk-free option. A similar finding was made by Chandrasekaran and colleagues, researchers who discovered that newborns who were given nasal prongs had a much higher incidence of serious nasal injuries (31% compared to 0%). Other researchers, such as Bashir et al. and Dubey et al., arrived at the same findings as before. Kumar et al., on the other hand, came to the conclusion that there was no statistically significant difference between the two groups in terms of the occurrence of the phenomenon in question. nasal injuries ($p=0.371$).

Similarly, Prakash et al. and Singh et al. arrived to the conclusion that same conclusions about their findings. When compared to nasal prongs, the results of using a nasal mask as an interface were just as successful in preterm babies who were receiving CPAP therapy. Yong et al. came to the conclusion that nasal trauma was a typical occurrence all throughout the nCPAP treatment process, regardless of the type of device that was utilized. Additionally, Fischer et al. came to the conclusion that nasal damage is a common consequence of (nCPAP) stands for normal continuous positive airway pressure. This study has a few shortcomings that needed to be addressed. There was no way to guarantee that the randomization would be blind. The scale that was utilized for evaluation was subjective, and there was a possibility of bias in the evaluation.

CONCLUSION

When it came to administering non-continuous positive airway pressure (nCPAP) to newborns with respiratory distress syndrome (RDS), nasal masks proved to be more suited than nasal prongs.

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