DOI: https://doi.org/10.53350/pjmhs22164811

ORIGINAL ARTICLE

Comparison of Bubble Continuous Positive Airway Pressure Versus Conventional Ventilation In Neonates with Respiratory Distress Syndrome

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ABSTRACT

Aim: The use of positive airway pressure in babies with respiratory failure has been associated with significant reductions in respiratory failure, morbidity, and death. The two most popular CPAP techniques are bladder CPAP (B-CPAP) and ventilator-assisted CPAP (V-CPAP). We wanted to see if B-CPAP and V-CPAP have different survival rates and problems.

Methods: This retrospective medical trial included 60 preterm babies between 1500- 2500 g who were hospitalized to Mayo Hospital's neonatal critical care unit for breathing difficulties between May 2019 and April 2020. Between May 2019 and April 2020, they were hospitalized for respiratory distress. The patients were allocated to therapy groups at random. To calculate and evaluate survival rates, a survival analysis was done. To compare rates of survival. The t-test for sample data was used to assess the length of supplemental oxygen, hospital stay, and cost of hospital stay.

Results: At 24 hours, the predicted survival rates in the B-CPAP and V-CPAP subgroups were 100% and 78%, correspondingly. The comparable results after 48 hours were 100% and 72%. Furthermore, the V-CPAP group's hospitalization expenditures were considerably greater than the B-CPAP groups.

Conclusion: Based on our findings, B-CPAP was helpful in treating newborns with breathing difficulties and reduced the hospitalization. In addition to the usual benefits, the lower cost of B-CPAP may be a factor for its widespread use when contrasted to V-CPAP.

Keywords: Bubble Continuous Positive Airway Pressure, Versus Conventional Ventilation, Neonates With Respiratory.

INTRODUCTION

Newborn pulmonary hypertension is a severe clinical issue that is associated with a higher illness, death mortality, and expenditures. The important risk factor is low birth weight, which is more frequent among the impoverished and uninsured. Supportive care with mechanical ventilation and a high concentration of inspired oxygen is the conventional technique of therapy for respiratory failure [1]. One research in the United States found a ventilator ventilation rate of 19 per 1,100 live births and a total cost of 4.5 billion dollars for respiratory failing therapy. Non-invasive respiratory assistance for premature newborns is gaining popularity. Traditional ventilators, the "bubbly bottle" method, and the baby flow driver are all utilized to create CPAP. The Newborn flow driver has already been demonstrated to be a viable device for controlling premature baby breathing difficulties [2]. In babies having respiratory arrest and apnea, CPAP is utilized. CPAP helps preterm newborns breathe in a variety of ways. It splints the upper airway, reducing blockage and apnea, assisting lung expansion, and preventing alveolar collapse. Underwater bubble CPAP (B-CPAP) and ventilator-derived CPAP (V-CPAP) are two prominent CPAP modes that employ distinct pressure sources. A variable resistor in a valve is changed in V-CPAP to offer restriction to the flow of air. Rather of utilizing a variable resistor, B-CPAP achieves positive pressure in the circuit by simply submerging the distal expiratory tube to a specified depth in a water column. In preterm babies, Lee et al established the advantages of BCPAP over V-CPAP [3]. Teresa et al demonstrated that using BCPAP is a possibly beneficial technique in extremely premature infants with RDS. Despite the this these distinct pressure sources for CPAP administration have already been utilized for 30 years, there are still no major randomized studies of B-CPAP vs traditional treatment with mechanical breathing, a fact that highlights a frequent quandary in medical trials [4]. Conducting a major trial too soon risks failure owing to both a lack of understanding of the optimum treatment approach to properly design the study and an incapability in the application of the new method. What is obvious is that in resource-constrained circumstances, B-CPAP looks to be an efficient and affordable approach to give respiratory support that is at least as good as respiratory support produced by substantially more expensive technology [5].

METHODOLOGY

This study was carried out in Mayo Hospital's level III newborn care unit at Jinnah Hospital, Lahore, Pakistan, between May 2019 and April 2020. The purpose of this study was to evaluate the efficacy of B-CPAP and V-CPAP in the treatment of newborns suffering from respiratory arrest syndrome. Every one of the individuals were born with the condition (gestation 28 to 36 weeks). This retrospective medical trial included 60 preterm babies between 1500- 2500 g who were hospitalized to Mayo Hospital's neonatal critical care unit for breathing difficulties between May 2019 and April 2020. Between May 2019 and April 2020, they were hospitalized for respiratory distress. The patients were allocated to therapy groups at random. To calculate and evaluate survival rates, a survival analysis was done. All sequentially born premature babies with birth weights ranging from 1500 to 2500 grammes with a Silverman Anderson retraction score of 7 or 8 are included in the. Babies were precluded if they had severe symptoms in addition to RDS, such as cardiac problems (not including patent ductus arteriosus [PDA]), congenital malformation such as congenital diaphragmatic hernia, tracheoesophageal fistula, and cleft lip/palate, and babies who had either breathing problems secondary to extreme asphyxia (Apgar score 4 at 1 and 6 minute or pH8.13), cardiovascular or respiratory. With the power and type-one error set at 85% and 7%, respectively, we calculated that the population in this study needed was 53 (26 each treatment group). The elimination approach was used to assign specific participants to treatment groups based on the baby's gender and birth weight (1500 versus >1600 grammes). We adjusted the gender and weight diversity in patients treated by using this approach. CPAP was administered nasopharyngeal in both subjects. The Bear 760 PSV Ventilator-derived CPAP likewise delivered a baseline fuel flow at a rate of 6 L/min, but its hose was linked to the ventilator's exhalation valve. The pressure tube was attached to the Y-piece, and the pressure was set to 6 cm H2O. CPAP was deemed effective if the baby's respiratory distress decreased and he or she could be effectively weaned off of it. The lack of respiratory depression (little or no public apologies and a respiratory rate among 35 and 65 beats per minute) and SpO2>92 percent on FiO2 33 percent and PEEP 6 cm of water were the parameters for weaning.

RESULTS

The demographic features of the B-CPAP and VCPAP groupings were identical, as shown in Table I. Bubble-CPAP was shown to be successful in 27 (963) infants, with just one requiring mechanical breathing on the sixth day. CPAP generated from a ventilator was successful in 19 (75%) of the individuals. Surfactant was given to a total of 26 infants, 15 in the B-CPAP group and 11 in the V-CPAP category, with no notable difference. IVH occurred in 5 neonates, 1 in the B-CPAP group and 4 in the V-CPAP group. There was no pneumothorax in any of the infants. Nasal trauma was detected in 13% of patients, although this did not involve septum trauma; the only consequence was minor nostril lesions that all healed before release. The mean treatment time in B-CPAP was not significantly significant from that in V-CPAP (37.9h vs 48.5h). When only patients who improved to therapy were included, the mean treatment time for the two different groups was 37.632.93h and 58.634.97h, accordingly, and the distinction was statistically relevant (P=0.05). In addition, we discovered a substantial difference in the mean period of hospital stay between B-CPAP and V-CPAP (9.84.4 vs 12.67.9 days, respectively). Table 2 lists the symptoms in patients who did not react to V-CPAP. The reaction to therapy was unaffected by gender or birth weight. The V-CPAP group, on the other hand, had a lower survival rate. The differential in survival rates in the first 24 hours was around 26 percent (100 percent in B-CPAP versus 78 percent in V-CPAP), showing the critical relevance of the initial hours of patient care. Just at end of the fourth day, the survival rate of newborns who got V-CPAP was 57 percent, and it held constant after that (Fig 1). The Log-Rank test revealed that there was a statistically significant difference between the survival curves. It really should be highlighted this because when we created a multifactorial Cox analysis to modify the treatment impact in the presence of additional factors, the model failed to convergence to a solution. This was due to the fact that only one incident occurred in the V-CPAP group.

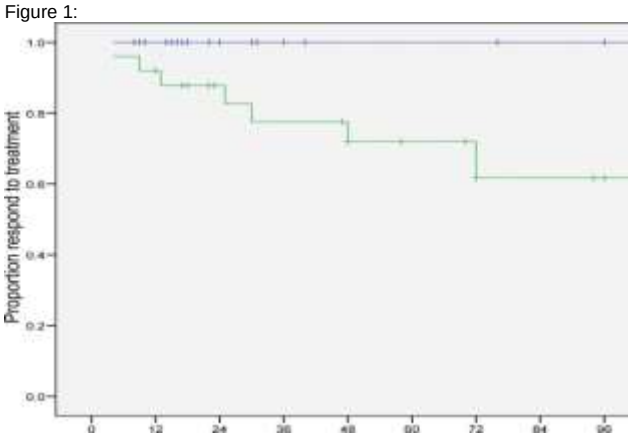
Table 1:

Variables		V-CPAP(n=25)	B-CPAP(n=25)	P-value
Gender	Female	11(44%)	13(52%)	0.9
	Male	13(52%)	14(56%)	
Gestational age	<=29	6(24%)	2(8%)	0.1
	30-32	13(49%)	11(42%)	
	33-37	9(33%)	15(57%)	
Birth Weight	1501-2100	15(57%)	16(61%)	0.9
	1100-1800	10(45%)	11(41%)	
Reply to action	Yes	8 (35%)	2(5%)	0.3
	No	19 (76%)	23 (93%)	
Period of hospital stay		11.7±8.4	9.7±4.5	0.4
Period of conduct		46.5±35.8	37.9±39.05	0.4
Complication		1	0	
		0	1	
		1	0	
		1	0	

Table 2:

Variables		V-CPAP		P-value
		Failure (n=6)	Success (n=19)	
Gender	Female	5(58.2%)	9(45.5%)	0.569
	Male	4(43.8%)	11(56.7%)	
Gestational age	<=29	2(15.4%)	5(24.3%)	0.34
	30-33	6(72.5%)	8(30.8%)	
	34-38	2(16.4%)	8(39.7%)	
Birth weight	1100-1800	6(72.5%)	7(35.4%)	0.19
	1900-2400	3(29.7%)	13(67.8%)	

Figure 1:



DISCUSSION

The primary purpose of this research was to evaluate the efficacy and problems of B-CPAP with V-CPAP. The importance of CPAP in the treatment of newborn respiratory failure had been well established. Various types of ventilators and CPAP devices have made it possible to compare these approaches [6]. Our data revealed that the failure rate related with B-CPAP was lower than that associated with V-CPAP, which contradicted the findings of Tagore et al. Similarly, Lee demonstrated that B-CPAP was far more successful than V-CPAP. Morley and Pillow's research, on the other hand, found that B-CPAP enhances respiratory effort in neonates more than VCPAP [7]. In our investigation, we noticed only one breakdown in the BCPAP subgroup; we did not explore the source of this failure. However, in Ammari's research, CPAP failure was related with positive pressure breathing during delivery and severe RDS. Urs further stated that individuals with mild to moderate RDS had a better likelihood of winning. B-CPAP uses mechanical oscillatory vibrations to replicate the waveforms produced by high-frequency ventilation. As a result, B-CPAP may exhibit both CPAP and HFV features [8]. This one has been observed that hemodynamics is conserved better while HFV than it was during the conventionally regulated mechanical ventilation, as well as when B-CPAP is used. Numerous researches have indicated that the "Columbia strategy," which involves using B-CPAP early in the disease of breathlessness in both preterm and term-gestation babies, can successfully decrease the risk of CLD [9]. Early commencement of nasal prong B-CPAP in conjunction

with tolerance to high PCO2 levels has been reported at Columbia University to lower the occurrence of CLD to 6% in babies weighing less than 1500 g, which is similar with our findings. In our study, utilizing B-CPAP reduced the average cost of hospitalization. Lanita et al. effectively showed all use of BCPAP in a poor nation, as well as the economic viability of B-CPAP [10].

CONCLUSION

According to our findings, B-CPAP appears to be preferable than V-CPAP in the therapy of RDS in preterm babies due to fewer problems, a shorter hospital stay, and a lower cost. When compared to V-CPAP, the convenience and inexpensive cost of B-CPAP make it an appealing alternative in resource-limited settings.

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