

Neonatal Ventilation in a Public Sector Hospital

Rajesh Shukla
Rekha Saikhedkar
Jayanand Mishra

Jawaharlal Nehru Hospital (Main Hospital of Bhilai Steel Plant, Madhya Pradesh) acts as a referral center for this industrial belt and its supportive population. Being a closely covered township with comparatively better income, education and medical supervision, booked cases constitute 88% of deliveries now. The Neonatal Unit was established in November, 1991. Ventilation data has been generated since then for intramural deliveries. In the present communication, we share our experience in ventilating neonates.

Subjects and Methods

Neonatal Unit of JLN Hospital, Bhilai, is an accredited Level-II Unit caring for only intramural births. The unit uses Bear Cub and one Sechrist IV 100-B ventilator for neonatal ventilation. There is central supply of oxygen and suction and uninterrupted power supply. Nursing care is provided by 8 nurses (apart from the

student nurses) with a nurse: patient ratio of 1:2.

Ventilation Protocol: Ventilation is initiated in neonates with a pH below 7.2, PCO₂ above 60 mm Hg and PO₂ below 50 mm Hg at FIO₂ 50-60% on oxygen hood; or persistent apnea; or critically sick neonates. Ventilation is usually initiated with PIP 14-18 cm H₂O, PEEP 4-6 cm, FIO₂ 50-60%, I:E ratio of 1:1 at the rate of 40-60/min in neonates below 1500 g and subsequently adjusted to maintain pH of 7.3, PaO₂ between 60-80 mm Hg and PaCO₂ of 40-50 mm Hg. Endotracheal CPAP is the usual choice, usual values of CPAP being 5-8 cm H₂O and FIO₂ 50-60%. Aminophylline is initiated before weaning the neonates from the ventilator. Routine analgesia is not used in ventilated infants. Muscle relaxation with pancuronium has been used only in 2 neonates. All neonates being ventilated receive prophylactic antibiotics - crystalline penicillin and amikacin.

All babies on ventilator receive IV fluids for first 2-3 days. Babies on short ventilation for 48 hours and those on CPAP are kept on IV fluids only. Tube feeds with expressed breast milk are started only after the general condition stabilizes, in small quantities. Oral feeds are stopped 6-8 hours before extubation.

Cranial ultrasound and echocardiography are not done routinely while infant is on the ventilator as they are not located in-house in the neonatal unit.

Results

During 1992-1994, a total of 1392 neonates were admitted to the Neonatal Unit, of whom 143 were ventilated. The survival of ventilated babies has risen from 24.3% in 1992 to 43.1% in 1994. CPAP was used in 26 (18.2%) neonates,

From the Neonatology Division, Department of Pediatrics, J.L.N. Hospital and Research Centre, Bhilai Steel Plant, Bhilai.

Reprint requests: Dr. Rajesh Shukla, Bl. No. 27, H.No. 3, Nehru Nagar (East), Bhilai (M.P.).

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the rest being ventilated by IMV.

Table I provides data on survival by indication for ventilation. It may be observed that the improved survival of ventilated neonates was largely due to improved survival of those with HMD and Asphyxia/MAS.

Table II provides data on mean birth weight, gestation and duration of ventilation by etiology. Most neonates were ventilated for less than 72 hours except in the case of HMD. Most babies

weighed >1500 g and were >34 week gestation, except in the case of HMD where the infants were smaller.

Complications observed during ventilation included pneumothorax in 11 (7.7%), intraventricular hemorrhage in 18 (12.6%) (detected by cranial ultrasound only in babies successfully weaned from ventilation), pulmonary hemorrhage in 16 (11.2%) and pneumonia in 29 (20.3%) cases. Patent ductus arteriosus was

TABLE I—Primary Diagnosis and Survival of Ventilated Neonates.

Diagnosis	1992		1993		1994	
	Cases	Survival (%)	Cases	Survival (%)	Cases	Survival (%)
HMD	9	1 (11)	11	3 (27.2)	14	6 (42.8)
Infections	11	4 (36.3)	14	4 (28.5)	17	7 (41.0)
Asphyxia/MAS	5	1 (20)	8	2 (25)	8	4 (50)
Apnea	5	2 (40)	6	2 (33.3)	7	4 (57.1)
PPHN	3	0 (0)	4	1 (25)	4	2 (50)
Congenital anomalies	2	0 (0)	2	0 (0)	3	1 (33)
Others	2	1 (50)	3	1 (33)	5	1 (20)

HMD-Hyaline membrane disease; MAS-Meconium aspiration syndrome; PPHN-Persistent Pulmonary hypertension of neonate.

TABLE II—Mean Weight, Gestation and Duration of Ventilation by Etiology.

Diagnosis (n)	Weight		Gestation		Duration	
	Mean (g)	Range	Mean (wks)	Range	Mean (h)	Range
HMD (34)	1175	640-1450	31	28-34	144	48-244
Infections (42)	1875	1300-2300	36	34-39	60	24-96
Asphyxia/MAS (21)	2740	1950-3300	38	36-41	42	12-72
Apnea (18)	1520	950-1900	34	32-26	48	24-76
PPHN (11)	2275	2000-2450	38	36-40	54	12-96
Congenital anomalies (7)	2150	1900-2800	39	37-41	48	24-72
Others (10)	1970	1600-2700	35	34-39	51	6-96

For abbreviations refer to footnote of Table I.

diagnosed in 14 cases (9.8%) by a combination of clinical features and Echocardiography. None of these underwent surgical ligation. Oral indomethacin was administered to 4 cases with no response. Only 11 infants <35 weeks who had received $\text{FiO}_2 > 0.5$ were screened for retinopathy of prematurity (ROP). Two were detected to have ROP. Sepsis was documented in 28.6% cases. *Klebsiella* was isolated in 58% followed by *E. coli* (22%), *Staph. aureus* (9.6%) and *Streptococcus* (9.6%).

Discussion

Like several other neonatal units in this country, our results have gradually improved. In the past, ventilation therapy used to be a terminal effort. Now, most babies below 1500 g are ventilated early. Our retrospective analysis demonstrates that experience in ventilation is an important factor in improving the results. Our survival rate amongst ventilated babies (43.1%) is comparable to other centers in India(1-7).

Our experience with CPAP using nasal prongs has been poor and therefore we have resorted to endotracheal CPAP. Amongst the observed complications, sepsis was the most frequent (28.6%). This figure is comparable to earlier reports(7).

Ventilatory support services are a key factor to improved survival. A lack of inhouse ultrasound is an important handicap. It is also important that a policy on use of analgesia/muscle relaxants be

available in each unit and also for screening of ROP. Trained Nurses are a key factor for improving ventilation results. It is suggested that short term training of nurses in units with good ventilatory outcome should be envisaged as also sharing of information at the national level.

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