

Care of intubated baby and weaning from ventilator

Dr. Binod Kumar Singh

Professor of Pediatrics, Patna

IAP State President, Bihar- 2019

IAP State Vice-President, Bihar- 2018

CIAP Executive board member-2015

NNF State president, Bihar- 2014

IAP State secretary, Bihar-2010-2011

NNF State secretary, Bihar-2008-2009

Fellow of Indian Academy of Pediatrics (FIAP)

Chief Consultant

Shiv Shishu Hospital

K-208, P.C Colony, Hanuman Nagar,

Patna - 800020

Web site : www.shivshishuhospital.org, Mob: -9431047667



Care of ventilated newborn

Introduction-

- meticulous care and careful monitoring of the ventilated baby is the key to successful outcome.
- ventilated baby must never be left unattended .
- Ideally 1:1 nurse- patient ratio should be there for all ventilated baby in NICU.

Types of care

- Thermal care
- Skin care
- Pulmonary care
- Infection control

Thermal care

- **Thermoneutral** environment as they are vulnerable to hypothermia.
- ELBW babies should preferably be **nursed in an incubator**.
- Room temp should be $> 26^{\circ}\text{C}$.
- Baby skin and bed should be kept dried.

Skin care

- Judicious and **minimal use of tape and adhesive** should be practiced.
- **Durapore** should be preferred as it is more skin friendly.
- **Tegaderm** can also be used to protect the skin.
- Skin may be **cleaned with** chlorhexidine-alcohol or povidone- iodine.

Pulmonary care

- **Heating and humidification**- during ventilation , temp of the gas delivered to the baby should be 37°C.
- The gas should be adequately humidified.
- Adequate humidification is clinically assessed by
the presence of some visible condensation in the inspiratory limb
and some water droplet in expiratory limb.

Positioning

- **Position of the baby** should be changed every 6-8 hours so that adequate ventilation of all the segments of lung may happen.
- **ET tube position**- tip of the ET tube should be at least 1 cm above carina at the level of T2 or T3 vertebra or level of second rib.

suctioning

- **Routine suctioning is not essential in all ventilated baby.** Suction should be done as and when required.
- **Indication-**
 - ✓ Visible secretions in ET tube
 - ✓ Coarse crackles over trachea or decreased breath sounds
 - ✓ Deterioration of oxygen saturation or bradycardia
 - ✓ Increase in paco₂
 - ✓ Sawtooth pattern in flow volume loop

Types of suction

- **Open suction** – It requires disconnection from ventilator .It is most commonly used method.
- **Closed Suction**- it does not require disconnection from ventilator.
 - It prevents lung de-recruitment associated with open suctioning. preferred in baby requiring high PEEP and FIO₂.
 - limitation of this is cost and associated increased risk of air leaks.

Technique of suctioning

- Baby should be preoxygenated for about a minute before suctioning with FIO₂ 10 % above the baseline in neonates.
- Size of suction catheter (Fr)= 2 ×Et tube size.
- Suction pressure should not be more than 100 mmhg.
- Shallow and gentle suction should be preferred, means insertion of catheter to predetermined length (length of Et tube+ adaptor)
- Each suction duration should be less than 15 seconds.
- Normal saline instillation is not routinely recommended, may be used when secretion is thick and tenacious.
- Suction catheter should be changed after single use.

- Change suction tubing after 24 hours
- Frequent suctioning of oral and pharyngeal secretion before and after ET tube suctioning is of utmost importance to prevent micro-aspiration and VAP.

Infection control

- Ensure proper **handwashing**.
- At least one elbow operated hand washing sink should be there for every 4-6 radiant warmer.
- Norms of one **trained nurse** for every 4 babies for normal nursery and one trained nurse for every ventilated baby in NICU should be maintained.
- **Laminar flow hood** should be used for preparing parenteral nutrition fluids.

Eye care

- In case of unconscious and paralyzed patient , eye care with artificial tear and eye pad is very essential.

Sedation and analgesia

- Pain and anxiety are common in a ventilated baby.
- The appropriate use of sedation & analgesia in ventilated baby is now well accepted.
- Dose is titrated based on pain and sedation score.
- Sedatives- midazolam
- Analgesics- morphine , fentanyl
- Muscle relaxants can not be recommended in ventilated newborn.

Doses of sedatives and analgesics

- **Midazolam** - 0.05 -0.15mg/kg IV bolus followed by 1- 10 mcg/kg/min
- **Morphine** – 0.05 -0.2mg/kg IV bolus followed by 10-15 mcg/kg/hr infusion
- **Fentanyl** – 1-4 mcg/kg IV bolus followed by 1-5 mcg/kg /hr infusion

Feeding and nutrition

- Once the patient is stable , **nasogastric tube feeding** should be started.
- Approximately 90-100 kcal/kg/day is sufficient for most infants.
- Ventilation is not contraindication for **enteral feeding**.

Monitoring of ventilated baby

- **Clinical evaluation** of baby with emphasis on vital parameters is very crucial for good outcome
- Multiple parameter monitoring :
 - ✓ **Oxygen saturation** – based on it FIO₂ is titrated and kept at minimum possible but at the same time hypoxia must be avoided
 - ✓ **EtCO₂** monitoring greatly reduces the need of frequent ABG
 - ✓ **Central venous pressure** to see hydration status of patient

Indication of chest Xray

- Immediately after intubation and central line placement
- Whenever there is acute deterioration
- At least once daily
- Frequency may be decreased on clinical ground in very stable ventilated baby

What to observe in X-ray

- **Position of ET tube** – should be at least 1 cm above carina at the level of T2 or T3 vertebra or level of second rib
- **Position of nasogastric tube-tip** should be inside stomach
- **Position of central line** -tip should be at the junction of SVC- RA
- **Lung expansion**- well inflated lung should be up to 8th posterior ribs

Laboratory evaluation

ABG-It should be done within 30 minutes of starting ventilation

- ✓ Ideally after every major setting change
- ✓ 4-6 hourly thereafter ?

Blood culture ,

Sepsis workup ,

Biochemical parameter

Weaning and extubation

- Discontinuation of mechanical ventilation involve two process
- **Weaning** – process of gradual reduction in respiratory support provided by the ventilator.
- **Extubation**- it is removal of endotracheal tube.

Weaning in neonates

- **Weaning should be attempted as soon as ;**
 - ✓ Underlying disease condition begins to improve
 - ✓ Baby is clinically stable
 - ✓ Blood gas normalized

Weaning mode:

First choice – PSV

2nd choice- SIMV+ PSV

General guideline for weaning

- Weaning should occur in small decrements.
- Decrease one parameter at a time.
- Most harmful parameter weaned first.
- ✓ PIP (in steps of 1-2 cm) – **first parameter to be weaned.**
- ✓ FIO₂ (in steps of 5 %)
- ✓ PEEP (in steps of 1-2 cm)
- ✓ RATE (in steps of 5 / min) – **last parameter to be weaned**

- In volume guarantee ventilation, decrease TV to maintain PCO₂ < 50 mmhg, PIP is automatically weaned.
- Weaning PEEP to < 5 cm H₂O is avoided.
- In PSV and AC modes, the set rate represents the back up rate therefore, decreasing rates do not lead to weaning.

Decrease PIP by 1-2cm H₂O till reached to 25cm H₂O(first setting to be reduced)



Decrease PIP and FIO₂ alternately, till PIP of 20 cmH₂O and FIO₂ of 0.6 is reached



FIO₂ and PEEP should be decreased hand in hand

Decrease PIP by titrating with paCO₂ value(paco₂ < 50mmhg)

Decrease RATE by 5 breaths/min till it reaches to 20/min

Extubate once setting reached to minimum (PIP ≤ 16, PEEP ≤ 5, rate 20/min , FIO₂ ≤ 0.30)

Weaning from HFOV

- ✓ FIO₂ is the first parameter to wean
- ✓ Monitoring of weaning should be done by frequent blood gas analysis
- ✓ Decrease **FIO₂** to < 40%
- ✓ Decrease **MAP** by 1-2 cm of H₂O up to 8 cm H₂O
- ✓ Decrease **amplitude** by 2-4 cm H₂O
- ✓ **Frequency** remains constant or usually weaned at last

Once baby is on MAP of 8-10 cm H₂O , Amplitude of 20-25 and Frequency of 10 hz, switch to conventional ventilation. Baby may be extubated directly and put on CPAP depending on clinical condition.

Extubation in neonates

- It should be a planned procedure . Thorough suction of the airway and nasopharynx should be done before removing ET tube.
- **Before extubation , ensure the following:**
 - ✓ Minimum ventilator support ($PIP \leq 16\text{cm H}_2\text{O}$, $PEEP \leq 5\text{cm H}_2\text{O}$, Rate 20/min, $FIO_2 \leq 0.30$)
 - ✓ Complete resolution of lung disease
 - ✓ Good respiratory effort
 - ✓ Withdrawal of sedation and inotropic support
 - ✓ Good nutrition

- ✓ Hemoglobin > 10 g/dl, NPO 6 hour prior to extubation
- ✓ Caffeine therapy prior to extubation in preterm neonates < 32 weeks GA (it reduces extubation failure by 50%)
- ✓ Dexamethasone 0.15 mg/kg for three doses only if infant is ventilated for more than 7 days or if intubated on multiple occasions

After extubation ,baby is placed on CPAP with PEEP of 5cm and FIO2 as required on ventilator before extubation.

Post extubation

- ✓ Strictly monitored for worsening of respiratory distress
- ✓ Use warm and humidified oxygen
- ✓ Gentle physiotherapy with frequent oral and nasal suctioning
- ✓ Frequent change in position
- ✓ NPO for 6 hours
- ✓ ABG or CXR is recommended as and when required

Extubation failure

- ✓ Lower GA \leq 26 weeks
- ✓ Prolonged ventilation > 10-14 days
- ✓ History of previous extubation failure
- ✓ Evidence of residual lung injury
- ✓ Extubation from high ventilatory setting
- ✓ Hemodynamic instability , sepsis, NEC , significant PDA
- ✓ Use of sedatives and analgesics



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DIABETES

WE WALK TO COMBAT

DIABETES

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JUNE 2005

Run
We're on Track
For a Cure