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EDITORIAL

Noninvasive Ventilation (NIV)

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Non invasive ventilation (NIV) refers to the provision of mechanical ventilator assistance without the need for an invasive (endotracheal) airway. Over the last 15 years it is assumed an important role in both acute & chronic forms of respiratory failure[1].

Types:

CPAP (continuous positive airway pressure) deliver positive pressure to airway which applies a steady pressure but does not actively assist inhalation.

NIPPV (noninvasive positive pressure ventilation) which consist of a higher pressure during inhalation to actively provide ventilator assistance usually combined with positive end expiratory pressure (PEEP).

What is BiPAP?

BiPAP is a certain assistance devices which are blower-based units that flacctuate between higher inspiratory pressures and lower expiratory pressure (bilevel) and that have single limb ventilation circuits. Because they have sensitive flow triggers and cycle into expiration in response to decrease in inspiratory flow, they function essentially as pressure support ventilators. With bilevel ventilation, the inspiratory positive airway pressure (IPAP) and expiratory positive airway pressure (EPAP) are absolute pressures and difference between them is the level of pressure support. With critical care ventilators the level of pressure support is added to PEEP. Thus a pressure support of 10 cm of H_2O and PEEP of 5 cm of H_2O are equivalent to and IPAP of 15 cm of H_2O and EPAP of 5 cm of H_2O.

NIPPV and its important role:

NIV has theoretical advantages over invasive mechanical ventilation. Intubation traumatizes the upper airway, possibly causing bleeding, vomiting or laceration of the trachea or esophagus, at the same time there needs expert professional and arrangement. The risk of nosocomial infection including health-care associated pneumonia, rises in proportion to the duration of intubation. Intubation is uncomfortable for the patients, requiring sedation and analgesia which add to potential complication and may slow weaning and extubation. By avoiding these potential complications NIV may improve outcomes by shortening duration of intubation and stays in the ICU and reducing the mortality rates.

What ventilators are used in NPPV:

Portable pressure limited "Bilevel" ventilators are used for the vast majority of outpatient applications of NPPV. Portable volume limited ventilators may be used as well but these compensate less well for leaks, are heavier and more alarms which becomes a nuisance unless the patient is dependent on mechanical ventilator nearly All time.

Bilevel ventilations have also become popular to deliver NPPV in the acute care setting. Although bilevel device function as well as or even better than critical care ventilators with regard to triggering, cycling and flow delivery, they should not be used for patients with hypoxemic respiratory failure unless equipped with oxygen blenders.

Indications of NPPV in acute care setting:

NPPV more rapidly improves vital signs and gas exchange and avoids the intubation compared to conventional therapy in patient with respiratory failure due to COPD exacerbation or acute cardiogenic pulmonary oedema or in association with immunocompromised status. In these patient NPPV should be considered the ventilator modality of first choice unless there are contraindications[2]. The use of NPPV in a variety of other forms of respiratory failure including Asthma, severe Community-Acquired Pneumonia occurring in the COPD patient or in the post operative setting after lung resection and hypoxemic respiratory failure.

NPPV should not be used:

NPPV should not be advised in case of acute deterioration in the end stage of interstitial fibrosis, sever ARDS with multiple organ dysfunction syndrome, post operative upper airway or esophageal surgery, upper airway obstruction with a high risk for occlusion.

Predictors of NPPV failure:

Advanced age, greater acuity of illness (a new simplified physiology score [SAPS II]>29), inability to cooperate (GCSd"11), inability to coordinate breathing with ventilator, air leaking from lack of dentition, severe hypercarbia (P_{CO2}>92 mm of Hg), acidemia (pH<7.25), failure to improve gas exchange, pH and heart and respiratory rates within first 2 hours.

How to initiate NPPV in acute respiratory failure:

NPPV in acute respiratory failure is initiated by a mask that fits properly and comfortable for the patient. Connect the mask to the ventilator initially at low pressure (8-12 cm of H_2O inspiratoy and 4-5 cm of H_20 expiratory) to facilitate adaptation. With volume limited modes a tidal volume 10-15 ml/kg is used. Oxygen supplementation through either an oxygen blender or a tube attached to mask or ventilator circuit should be adjusted to maintain a target saturation >90-92%[3]. The difference between the inspiratory and the expiratory pressure is the pressure support and because this pressure is responsible for decreasing respiratory distress and facilitating the elimination of CO_2, the inspiratory pressure should be increased or tolerated, usually to pressure between 12 cm of H_2O and 20 cm of H_2O. The expiratory pressure can be increased (usually to a maximum of 8 cm H_2O) to facilitate triggering in patient with auto-PEEP or to treat hypoxemia.

Monitoring of patients on NPPV:

Patients started on NPPV in the acute setting require close monitoring, as dictated by the acuity of their illness. Subjective responses are important initially, particularly comfort and respiratory distress. Respiratory rate and sternocledomastoid muscle activity should be diminishing and abdominal paradox should be abolished. Oximetry should be monitored continuously at first and blood gases should be obtained periodically (usually within the first hour or two and then as clinically indicated to ascertain changes in $PaCO_2$).

When NPPV can be discontinued?

Patient stabilization as indicated by adequate oxygenation (O_2 saturation >90% on FiO_2 d"40% or equivalent; expiratory pressure ≤5 cm of H_2O) and amelioration of respiratory distress (Respiratory rate ≤24/min) during ventilator use. The patient is then removed from assisted ventilation and is observed while breathing supplemental O_2 as needed. Patient who developed increasing inspiratory distress or deterioration of gas exchange are placed back on NPPV at the previous settings and are allowed to rest for few hours with weaning tried again periodically.

Indications of NPPV in chronic respiratory failure:

NPPV is indicated when symptomatic nocturnal hypoventilation develops in wide variety of slowly progressive neuromascular disorders such as limb gardle mascular dystrophy, post polio syndrome and multiple sclerosis[4]. Ideally assisted ventilation is started before the development of day time hypercapnia to better control of symptoms and to minimize the likelihood of a respiratory crisis before the patient can adequately adapt to NPPV. When FVC<50% of predicted or when maximal inspiratory pressure is below 60 cm of H_2O even in absence of symptoms also permit initiation of NPPV. Patient with severe kyphoscoliosis or central hypoventilation are also good candidates. Obstructive sleep apnea with hypoventilation or obesity-hypoventilation are also good candidates.

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