

reducing work of breathing by decreasing pulmonary dynamic hyperinflation and resistance of the respiratory system.<sup>[2]</sup>

Effective delivery of aerosol to the lungs depends on formulation of drug, aerosol generator, and technique of administration. Various devices are used to generate aerosol, but pressurized metered-dose inhaler (pMDI) and nebulizers are the most commonly used in patients supported by IMV. The commonly used nebulizers are the jet and the ultrasonic devices. Vibrating mesh nebulizers and intratracheal nebulizing catheters are newer aerosol generating devices. These devices are connected to the inspiratory limb of the ventilator circuit by specific adaptors attached to the artificial airway. Several ventilator parameters also affect the effective delivery of aerosol to the patient. pMDI require a specific adaptor, a spacer and synchronization with ventilator for effective delivery of aerosol. If properly administered pMDI and nebulizers are equally effective in delivery of aerosol therapy to the mechanically ventilated patients although using nebulizers is the common practice.

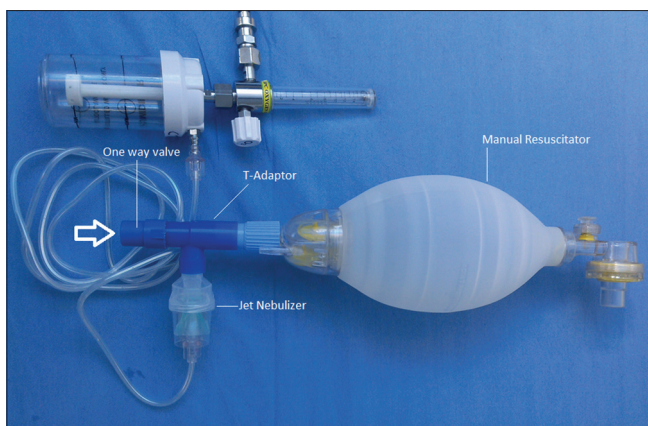
Jet nebulizers use a jet of compressed air or oxygen, while ultrasonic nebulizers use piezo-electric crystals vibrations to produce aerosol. New vibrating mesh nebulizers use a vibrating mesh or plate with multiple apertures to generate aerosol. Jet nebulizers are cost-effective and easy to use and adding a reservoir between jet nebulizer and endotracheal tube increases aerosol delivery. Some new generation ventilators have an in-built mechanism for supporting the jet or ultrasonic nebulizers. These ventilators synchronize inspiratory flow and volume to activate the jet nebulizer intermittently during inspiration.<sup>[3]</sup> Over a period of time, these compatible jet nebulizers tend to be damaged or lost. Many ventilators are not compatible with jet nebulizers or newer aerosol therapy devices. In these situations, often a jet nebulizer operated by compressed oxygen from wall system or cylinder, is attached to the inspiratory limb of breathing circuit. A minimum flow of 6-8 L is required to generate the aerosol. The volume added by this method can affect ventilator parameters and can be very harmful, especially to the pediatric patients who have small lung volumes.

Self-inflating manual resuscitator is a breathing system that uses nonrebreathing unidirectional valves. A pressure limiting device is present near inspiratory valve to prevent barotrauma in all infant/child and some adult manual resuscitators. There is a connection port to attach a reservoir bag at the bag inlet.<sup>[4]</sup> In this

## Improved arrangement of aerosol delivery to the ventilator dependent patient

Sir,

The patients supported by invasive mechanical ventilation (IMV) often require aerosol therapy for bronchodilators and inhaled corticosteroids. Mucolytics, antibiotics and other medications can also be given by this method.<sup>[1]</sup> Aerosol therapy is indicated in these patients for management of asthma, bronchospasm, increased airway resistance, intrinsic positive end-expiratory pressure, difficult to wean, and ventilator dependent patients. Aerosol therapy helps in



**Figure 1:** Improved arrangement

improvized arrangement, a T-adaptor with jet nebulizer assembly is attached to the above mentioned connection port [Figure 1]. A one-way valve [Direction, Figure 1] is attached to the free end of the T-adaptor to prevent aerosol loss and direct airflow to the bag inlet when it is re-expanding. Presence of resuscitation bag next to the jet nebulizer and addition of 3-4 mL of normal saline to the drug can help in effective delivery of aerosol. The tidal and minute volumes can be controlled manually to deliver aerosol safely to the ventilator dependent patients where compatible aerosol device is not available.

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### References

1. Rubin BK. Air and soul: The science and application of aerosol therapy. *Respir Care* 2010;55:911-21.
2. Guerin C, Fassier T, Bayle F, Lemasson S, Richard JC. Inhaled bronchodilator administration during mechanical ventilation: How to optimize it, and for which clinical benefit? *J Aerosol Med Pulm Drug Deliv* 2008;21:85-96.
3. Dhand R. Aerosol delivery during mechanical ventilation: From basic techniques to new devices. *J Aerosol Med Pulm Drug Deliv* 2008;21:45-60.
4. Dorsch JA, Dorsch SA. Manual resuscitators. In: *Understanding Anaesthesia Equipments*. 5<sup>th</sup> ed. New Delhi: Lippincott William's and Wilkins; 2008. p. 282-93.

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