A Syringe-Actuated Metered Dose Inhaler for Patients with Tracheal Intubation

Dear Sir,

Administration of bronchodilators through a metered-dose inhaler (MDI) in intubated patients is often required in the perioperative period. In general, an MDI is considered more effective than nebulizers. However, its efficacy is limited due to deposition of the aerosol on the tracheal tube wall resulting in wastage of medication. Various innovations have been tried to overcome this problem to facilitate deposit of a larger amount of drug in the respiratory tract. Apart from commercially available adaptors, nozzle extension with catheter has been tried to improve the distal delivery of the bronchodilators released from the MDI.[1] These adaptors may be able in depositing only a fraction of the actuated dose into the tracheobronchial tree, whereas there are issues with the formation of a reliable connection between the catheter extension and the MDI nozzle.

We present another innovation used by us that can be quickly assembled with the help of disposables readily available in the operation room. We use a 50 ml syringe with Luer lock nozzle for this purpose. Tissue dilators used for central venous or hemodialysis catheterization are available in various lengths and diameters. An appropriately sized tissue dilator is selected and fitted into the syringe for this purpose as shown in Figure 1. Usually, we attach a 14 F tissue dilator for this purpose in adult patients having a tracheal tube with an internal diameter ranging from 7.0 mm to 8.5 mm. The tapered end of the tissue dilator can be cut off, if required. The MDI canister is loaded into the syringe as shown and its tip is brought in alignment with the syringe nozzle. The syringe barrel holds the canister that is actuated by depressing the syringe plunger. After shaking the assembly to ensure uniform dispersion of the drug particles in the propellants, a sharp thrust to the plunger helps in depositing the aerosol down into the tracheal tube so that the aerosol is deposited nearer to the tracheobronchial tree. Based on a previous experimental study, we limit the number of actuations to three before looking for clinical response.[1] If the patient is breathing spontaneously, we time the actuation so that the drug is deposited at the end of expiration.

Care should be taken not to insert excessive length of the dilator inside the tracheal tube as it can directly traumatize the airway. It is known that the propellant, surfactant, or other constituents of the MDI formulation may cause mucosal damage in the tracheobronchial tree if deposited directly thereon.[2] In our device, the aerosol is delivered proximal to the tracheal tube tip. The propellant like hydrofluroalkane and constituents like ethyl alcohol[3] are not deposited directly on the tracheal mucosa. Another precaution to be taken is that the tissue dilator should be screwed tightly to the syringe so that it does not get detached during the actuation.

Figure 1: The syringe-actuated metered dose inhaler assembly

Intravenous catheter and pediatric tracheal tube have been modified and used for preparing similar devices in the past.[1] Our device does not require any modification as the tissue dilator is Luer hubbed and does not need any modification for attachment to the syringe. All components of our assembly are easily available and do not cost much. It is simple to assemble also. However, there is a need for quantitative laboratory evaluation of the MDI drug delivery through this extension.

Based on the efficacy and convenience of this device, we recommend its use in patients requiring bronchodilator therapy in the setting of tracheal intubation in the operation room.

Acknowledgment

Written informed consent for publication was obtained from the patient.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Prakash K. Dubey, Preksha Dubey[1], Neeraj Kumar[2]

Department of Anesthesiology, Indira Gandhi Institute of Medical Sciences, [2]Department of Trauma and Emergency (Anaesthesiology), All India Institute of Medical Sciences, Patna, Bihar, [1]Department of Oral and Maxillofacial Surgery, ITS Dental College, Greater Noida, Uttar Pradesh, India

Address for correspondence: Dr. Neeraj Kumar, Department of Trauma and Emergency (Anaesthesiology), All India Institute of Medical Sciences, Patna - 801 505, Bihar, India.
E-mail: neeraj.jlnmc@gmail.com

References

1. Peterfreund RA, Niven RW, Kacmarek RM. Syringe-actuated metered dose inhalers: A quantitative laboratory evaluation of albuterol delivery through nozzle extensions. Anesth Analg 1994;78:554-8.
2. Spahr-Schopfer IA, Lerman J, Cutz E, Newhouse MT, Dolovich M. Proximate delivery of a large experimental dose from salbutamol MDI induces epithelial airway lesions in intubated rabbits. Am J Respir Crit Care Med 1994;150:790-4.
3. Partridge MR, Woodcock AA, Propellants. In: Bisgaard H, O'Callaghan C, Smaldone GC, editors. Drug Delivery to the Lung. New York: Marcel Dekker; 2002. p. 371-88.

Access this article online

Quick Response Code:

Website: www.ijrconline.org

DOI: 10.4103/ijrc.ijrc_30_18

How to cite this article: Dubey PK, Dubey P, Kumar N. A syringe-actuated metered dose inhaler for patients with tracheal intubation. Indian J Respir Care 2019;8:66-7.