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The use of inhalers in patients with tracheal stomas or tracheostomy tubes

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Abstract
Patients with chronic obstructive airways disease (COAD) or asthma who have a tracheostomy tube or tracheal stoma have difficulty using metered dose inhalers (MDIs) because of a failure to achieve a good seal between the tracheostomy tube or stoma and the MDI or spacer device mouthpiece. Many such patients therefore utilize nebulizers. MDIs in comparison to nebulizers have the advantages of being more compact, portable, easy to use, less time-consuming, and cheaper. We present the case of a 74-year-old man who underwent a laryngectomy with tracheal stoma formation who had a poor response with nebulizers and required oral steroids. He was subsequently, with the help of a number of attached devices, able to use his MDIs to good effect. We describe a number of devices and adaptors to enable patients with laryngectomy stomas or tracheostomy tubes to utilize MDIs and undergo respiratory function tests. We recommend that all such patients should have the benefit of a consultation with a dedicated respiratory nurse who can provide the appropriate MDIs, devices and adaptors to optimize the treatment of their lower respiratory tract condition.

Key words: Tracheostomy; Laryngectomy; Nebulizers and vaporizers; Respiratory function tests

Introduction

Metered dose inhalers (MDIs) are a well established method of administering bronchodilator and corticosteroid drugs in the form of aerosols, in patients with COAD and asthma. Many patients with COAD or asthma who undergo a laryngectomy with stoma formation or have a tracheostomy tube inserted, subsequently utilize nebulizers rather than revert to their original inhalers due to difficulty in utilization. This difficulty arises from failing to achieve a good seal between the stoma or tracheostomy tube and the MDI mouthpiece.

MDIs in comparison to nebulizers have several advantages. They are compact, portable, easy to use, less time-consuming and cheaper. Furthermore, steroids, when given via a nebulizer in the form of beclomethasone diproprionate, take up to 20 minutes to deliver and appear to be much less effective than when given via a MDI (Storr *et al.*, 1986; Webb *et al.*, 1986). Therefore, it is to the patients' and health service's advantage to enable them to use inhalers.

Spacer devices, designed primarily for children and the elderly, ease the application of inhalers. They are designed to contain the spray momentarily before it is inhaled. Co-ordination between firing the MDI and inhaling is not required thus overcoming poor techniques. Furthermore, the velocity of the propellant droplets is reduced and they evaporate within the spacer so that the aerosol is less likely to impact on the oropharynx when inhaled (Newman *et al.*, 1986). These spacer devices were designed for use via the oropharyngeal route. The mouthpieces do not fit the aperture of most tracheostomy tubes and adaptor devices are not readily available. This leaves an inadequate seal resulting in most of the aerosol leaking out around the tube and little being delivered to the lungs. In addition, the lack of a seal may render the patient unable to open the valve of the spacer on inspiration preventing the inhalation of medication.

Case report

A 74-year-old man underwent a total laryngectomy for laryngeal carcinoma. He suffered from COAD and had taken bronchodilator and steroid inhalers prior to the operation. Post-operatively he had difficulty using his inhalers and had a poor response with nebulizers necessitating the use of oral steroids and in-patient treatment. He was referred to the respiratory physicians

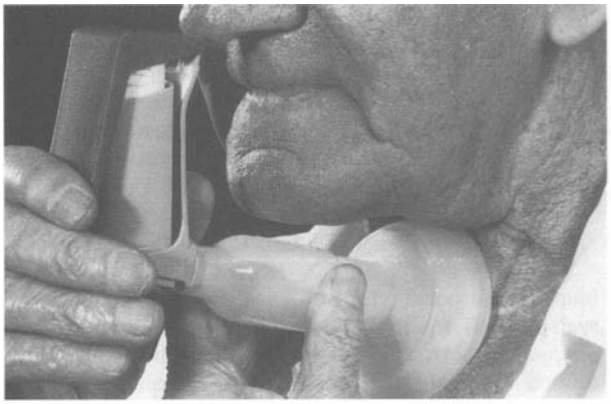

Fig. 1
Patient with a tracheal stoma and good inhalation technique (as in our patient): Size 2 Laerdal infant mask, inhaler extension tube and MDI with optional Haleraid.

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FIG. 2

Patient with a tracheal stoma and poor inhalation technique: Size 2 Laerdal infant mask, babyhaler and MDI.

who sought the advice of their specialist respiratory nurse. A spacer device was applied but the patient was unable to create an adequate seal in order to open the spacer's valves sufficiently on inspiration. He was therefore given adaptors to enable him to use his inhalers to good effect. A size 2 Laerdal infant mask afforded a seal around the stoma. To this was applied an inhalation aid to reduce the speed of the application and act as a mini-spacer. The inhaler was applied to the inhalation aid (Figure 1).

The patient mastered the technique of application with relative ease and has subsequently not required a course of oral steroids or an admission for a COAD exacerbation for over one year.

Discussion

A similar case to ours was presented by Weber and Brown (1984). Their patient showed a substantial symptomatic improvement in his COAD with the application of terbutaline given via a Nebuhaler. This spacer device was applied directly over the stoma area. The precise application over the stoma can be difficult in some patients and an adequate negative pressure in order to open the spacer's valve may not be possible, as in our patient.

Meeker and Stelmach (1992) described the use of an inhaler in a patient with a stoma by way of an aerochamber with mask that was originally marketed for use in the paediatric population. The mask conformed to the neck anatomy forming a seal. The aerochamber could also be adapted to fit an in-dwelling tracheostomy tube with adaptors but these adaptors are not readily available.

FIG. 3

Patient with a tracheostomy tube and good inhalation technique: Adaptor (15F–22F)*, inhaler extension tube and MDI with optional Haleraid.

FIG. 4

Patient with a tracheostomy tube and poor inhalation technique: Adaptor (15F–22M)*, piece of elephant tubing*, Nebuhaler or Volumatic spacer device and MDI.
*available from Intersurgical.

With regard to patients with tracheostomy tubes O'Callaghan *et al.* (1989) described the case of a two-year-old girl with severe asthma who had a tracheostomy tube inserted for a subglottic stenosis. In order for her to use inhalers the inhalation port of the volumatic spacer was modified by a series of tubes enabling connection with the tracheostomy tube with an airtight seal. However, the precise nature and source of the adapting tubes was not stated.

Nakhla (1997) described the case of a creative patient who designed his own adapting spacer device. He simply took a plastic soft drinks bottle and cut out a hole at one end to fit the mouthpiece of the inhaler and a hole in the other screw top end to fit snugly onto his tracheostomy tube. He found that his device was easy to use and he achieved a good airtight seal so that little of the aerosol escaped around the tracheostomy and there was therefore an adequate delivery of the drug into the bronchial tree.

We present a number of devices to enable patients with a tracheal stoma or trachostomy tube, with either a good or poor inhalation technique, to utilize MDIs. The recommended devices for the different patient scenarios are depicted in Figures 1–4. Some inhalers may fit directly onto a tracheostomy tube and size 2 Laerdal infant mask but incorporating the inhaler extension tube, as used in patients with a good inhalation technique (Figures 1 and 3), reduces the velocity of the inhaled particles and provides a mini-spacer thereby reducing the irritation and deposition in the trachea. In patients with a tracheal stoma and poor inhalation technique (Figure 2) the Babyhaler is preferred to adult spacer devices as the valve is easier to open on inhalation. The pressing of the MDI may be aided by a Haleraid device (Figures 1 and 3).

Respiratory function testing in patients with tracheal stomas or tracheostomy tubes is difficult, again due to the problem of failing to achieve a good seal between the tracheostomy tube or stoma and the peak flow meter

TABLE I

RESPIRATORY FUNCTION TEST RESULTS PRE- AND POST-INHALATION OF SALBUTAMOL (400 MCG) GIVEN VIA THE DEVICES DEPICTED IN FIGURE 1

	Pre-inhalation		Post-inhalation	
	1.	2.	1.	2.
Peak expiratory flow rate (l/min)	84	97	205	267
Forced expiratory volume$_1$ (l)	0.59	0.46	0.95	1.03
Forced vital capacity (l)	0.90	0.67	1.45	1.48

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mouth piece. However, the mouthpiece of a Mini Wright peak flow meter or VM1 spirometer enables readings to be obtained in these patients. With this mouthpiece, standard pulmonary function devices can be connected to a tracheostomy tube via the same adaptor (15F–22F) as used in Figure 3. They can also be connected to a size 2 Laerdal infant mask as used in Figure 1 which is then placed firmly over a stoma. Spirometry in our patient using the latter method gave reproducible results with a significant improvement on inhaling four puffs (400 mcg) of salbutamol, see Table I; possibly related to the bypassing of the dead space resulting in a more efficacious administration of medication. Loss of the larynx results in significantly lower than predicted peak flow values. This is thought to be due to the loss of air compression against a closed larynx before forced expiratory effort (Davidson *et al.*, 1986). Nevertheless, relative readings in the individual patient may be of value, as in our patient.

There are a large number of inhalers and inhaler-related products available on the market for patients with COAD and asthma. With the introduction of CFC-free inhalers the number of products will no doubt increase. We recommend that all patients with tracheostomy tubes or stomas be considered for referral to a dedicated respiratory or asthma nurse, to whom most hospitals have access, to try the products available and decide which combination of inhalers and components is best for them. By using such devices the advantages of MDIs over nebulizers may be realized, with ease of use, increased compliance and effective therapy.

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References

Davidson, R. N., Hayward, L., Pounsford, J. C., Saunders, K. B. (1986) Lung function and within-breath changes in resistance in patients who have had a laryngectomy. *Quarterly Journal of Medicine* **60:** 753–762.

Meeker, D. P., Stelmach, K. (1992) Modification of the spacer device: use in the patient with arthritis or an artificial airway. *Chest* **102:** 1243–1244.

Nakhla, V. (1997) A homemade modification of a spacer device for delivery of bronchodilator or steroid therapy in patients with tracheostomies. *Journal of Laryngology and Otology* **111:** 363–365.

Newman, S. P., Woodman, G., Clarke, S. W., Sackner, M. A. (1986) Effect of InspirEase on the deposition of metered dose aerosols in the human respiratory tract. *Chest* **89:** 551–556.

O'Callaghan, C., Dryden, S., Cert, D. N., Gibbin, K. (1989) Asthma therapy and a tracheostomy. *Journal of Laryngology and Otology* **103:** 427–428.

Storr, J., Lenney, C. A., Lenney, W. (1986) Nebulised beclomethasone dipropionate in preschool asthma. *Archives of Disease in Childhood* **61:** 270–273.

Webb, M. S. C., Milner, A. D., Hiller, E. J., Henry, R. L. (1986) Nebulised beclomethasone dipropionate suspension. *Archives of Disease in Childhood* **61:** 1108–1110.

Weber, P. A., Brown, A. R. (1984) The use of a conical spacer after laryngectomy. *British Medical Journal* **288:** 1537 (letter).

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