Using mucociliary clearance methods that do not require an artificial airway

Suction is used to clear secretions from the airways of patients who have an endotracheal tube, tracheostomy, minitracheostomy in place or those with an oropharyngeal airway (Lewis, 2002; McConnell, 2000; White, 1997). However, patients who do not have an artificial airway may sometimes require nasotracheal or nasopharyngeal suction (via the nose) or oropharyngeal suction (via the mouth).

These procedures are unpleasant for the patient and have associated complications, for example, damage to the tracheal epithelium. They should therefore be used only when all other efforts to clear airway secretions have failed.

Hough (1992) clearly states that performing suction using force is unethical and illegal, except in life-threatening situations.

Is suction necessary? Hess (2001) suggests a clinical hierarchy of four questions to ask about a patient when considering the use of secretion clearance techniques:

● Is there a pathophysiologic rationale for using the therapy? It should be remembered that production of large amounts of sputum does not mean the patient is experiencing difficulty clearing it from the airway;

● What is the potential for adverse effects from the treatment? Consider which treatment will provide the greatest benefit with the least harm;

● What is the patient’s preference;

● What is the cost of the equipment? Some devices are very expensive.

Indications for suction There are three reasons for carrying out suction on a non-intubated patient:

● The patient is unable to cough effectively (a cough is a natural mechanism for clearing an airway) (Lapin, 2002);

● Secretions are retained in the respiratory tract;

● The patient’s airway needs to be cleared in an emergency situation.

Emergency situations Oropharyngeal suction is indicated during a resuscitation attempt. Effective airway management is a vital aspect of resuscitation and suction equipment capable of rapidly clearing the airway of secretions is a prerequisite (Vandenbarg and Vinson, 1999). A study by Vandenberg et al (1999) suggests that using a large-diameter suction system is an effective method for rapidly clearing secretions from the oropharynx, which has clear advantages in an emergency.

Cough stimulation Nasotracheal suction is a means of stimulating a cough; examples of when it may be required include:

● When an acute exacerbation of chronic bronchitis has led to carbon dioxide narcosis and respiratory failure;

● In neurological disorders;

● Following postoperative complications or laryngeal dysfunction.

It is contraindicated in the presence of stridor (the noise heard on breathing when the trachea or larynx is obstructed); bronchospasm (an abnormal contraction of the smooth muscle of the bronchi, resulting in acute narrowing and obstruction of the respiratory airway); or where there is a leak of cerebral spinal fluid into the nasal passages (Pryor and Prasad, 2002).

Problems associated with suctioning Nasotracheal/nasopharyngeal suction is associated with three key adverse effects: damage to the airway epithelium, hypoxia (a deficiency of oxygen in the tissues) and emotional distress to either the patient or their family. Suction may also cause laryngeal spasm or vagal nerve stimulation that can lead to cardiac arrhythmias (Pryor and Prasad, 2002). The possible adverse effects in children are listed in Box 1.

Preventing damage to airways The cilia (hair-like processes) found in the respiratory tract are an important part of the body’s mechanism for removing secretions so it is crucial that they are not damaged during suction. The impact of airway suction on the tracheal epithelium can be minimised by using an appropriate catheter and technique.

REFERENCES


The use of a catheter that is too large will increase the risk of damage and airway collapse; a catheter with a one eye inlet will cause more damage to the tracheal epithelium than a catheter with two eye inlets, and multiple eyes will cause the least damage (Macmillan, 1996).

The vacuum pressure, used to perform suction, should be kept as low as possible (60-120mmHg in adults), but this will vary, as it will depend on the viscosity of the mucus and patient’s age (Pryor and Prasad, 2002). In addition to this, Pryor and Prasad (2002) recommend the use of a built-in finger control or Y-connector, which will allow a gradual controlled increase in suction pressure.

**Risk of hypoxia** As suction can cause hypoxia (a deficiency of oxygen in the tissues), oxygen should be available throughout the procedure (Pryor and Prasad, 2002) and the patient should be observed for signs of hypoxia. The administration of oxygen may help prevent a fall in the partial pressure of oxygen during the procedure and subsequent development of hypoxia (Hough, 2000).

**Alternative approaches** Suction performed correctly with the oxygen available can provide a means of stimulating a cough and removing secretions. This will help avoid the need for more invasive techniques such as minitracheostomy, endotracheal intubation or bronchoscopy to prevent or treat sputum retention. However, suction should not be used routinely and initiated only when other methods of promoting a cough and removing secretions have failed.

Terms such as ‘bronchial hygiene’ and ‘pulmonary toilet’ have been used to describe the process of assisting patients to clear airway secretions (Fink and Rubin, 2002). All these techniques rely on two key physical principles: firstly that there must be airflow and secondly for the patient to have airflow, they must be able to get air behind the secretions in the respiratory tract (Lapin, 2002).

Some alternative techniques to suction are listed in Box 2. These can be used to improve secretion clearance from the lower respiratory tract and are usually initiated by a physiotherapist. However, it should be remembered that fundamental nursing interventions can help prevent sputum retention and the subsequent need for suction. These include providing hydration, especially warm drinks; preventing a dry mouth; providing adequate pain relief; and encouraging mobilisation or a change of position. Davidson (2002) provides a review of secretion clearance techniques in children.

**Box 2. Techniques to clear secretions from the lower respiratory tract in adults**

- Directed cough
- Forced expiratory technique
- Chest physiotherapy
- Positive expiratory pressure
- Flutter valves
- Active cycle of breathing
- Autogenic drainage
- Manual hyperinflation
- High-frequency chest wall oscillation
- Intrapulmonary percussive ventilation
- Exercise
- Bronchoscopy
- Mucus-modifying drugs

A bronchoscopy may be performed when all other measures including suctioning have failed to facilitate the effective removal of secretions. However safe, comfortable suctioning can be achieved via a minitracheostomy, thus avoiding the need for more invasive measures such as bronchoscopy, intubation or tracheostomy.

**Pharmacological approaches** Mucoactive drugs are intended to serve one of two purposes, either to increase the patient’s ability to expectorate sputum or to decrease hypersecretion of mucus. They can be classified according to their proposed mechanism of action and include:

- **Expectorants**: these are thought to increase the volume or hydration of airway secretions. However, classic expectorants have not been demonstrated to be clinically effective.
- **Mucolytics**: to reduce sputum viscosity;
- **Mucokinetics**: to increase the efficiency of the mucociliary system or cough efficiency;
- **Mucoactive drugs**: to reduce the volume of mucus secretions;
- **Drugs that can improve cough efficiency by increasing expiratory airflow such as bronchodilators or surfactant which decreases sputum adhesion (Rubin, 2002).**

**Conclusion** The use of suction has a role in the management of airway secretions, but alternative airway clearance techniques should be considered first. It is important for every nurse working in any clinical setting to be proficient at airway management and to have access to appropriate suction equipment for use in emergency situations.

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**REFERENCES**


**FOOTNOTE**

Carol Law will describe the procedure for carrying out suction in the next issue of the Respiratory Care supplement.