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Influence of the cuff pressure on the swallowing reflex in tracheostomized intensive care unit patients

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Background:

Because recovery of an efficient swallowing reflex is a determining factor for the recovery of airway protective reflexes, we have studied the influence of the tracheostomy tube cuff pressure (CP) on the swallowing reflex in tracheotomized patients.

Methods:

Twelve conscious adult intensive care unit (ICU) patients who had been weaned from mechanical ventilation were studied. Simultaneous EMG of the submental muscles with measurement of peak activity (EMGp) and amplitude of laryngeal acceleration (ALA) were performed during reflex swallows elicited by pharyngeal injection of distilled water boluses during end expiration. After cuff deflation, characteristics of the swallowing reflex (latency time: LaT, EMGp, and ALA) were measured at CPs of 5, 10, 15, 20, 25, 30, 40, 50, and 60 cm H(2)O.

Results:

LaT and CP were linearly related ($P<0.01$). CP was inversely correlated ($P<0.01$) to both ALA and EMGp.

Conclusions:

We demonstrated that LaT, EMGp, and ALA of the swallowing reflex were influenced by tracheostomy tube CP. The swallowing reflex was progressively more difficult to elicit with increasing CP and when activated, the resulting motor swallowing activity and efficiency at elevating the larynx were depressed.

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Swallow Physiology in Patients with Trach Cuff Inflated or Deflated: A Retrospective Study

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Background:

Past research has suggested that medical diagnosis and trach cuff conditions may contribute to swallow physiology changes in patients with tracheostomy. This study attempts to investigate the differences in swallow physiology between patients with trach cuff-inflated and trach cuff–deflated conditions with respect to four medical diagnostic categories: neuromuscular disorder, head and neck cancer, respiratory diseases, and general medical diagnosis.

Methods:

Retrospective database analysis of videofluoroscopic study results in 623 patients with tracheostomies with trach cuff-inflated or cuff– deflated conditions. Swallow disorders were examined for each patient.

Results:

The frequencies of reduced laryngeal elevation and silent aspiration were found to be significantly higher in the cuff-inflated condition than the cuff– deflated condition. Significant swallow physiology changes were also found to be significantly different among various medical diagnostic categories.

Conclusions:

It is important to evaluate changes in swallow physiology under both the trach cuff-inflated and cuff– deflated conditions to fully assess swallow function.

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Swallowing With a Tracheostomy Tube in Place: Does Cuff Inflation Matter?

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Abstract:

Patients undergoing tracheostomy may recover enough to be weaned from mechanical ventilation but continue to need the tracheostomy tube for airway toilet. When feeding a patient with a tracheostomy tube in place, it is unclear if the cuff should be inflated or not. This study was undertaken to determine whether cuff status has any impact on aspiration of feedings. Selected patients with tracheostomies who were weaned from the ventilator underwent fluoroscopic swallowing studies with the tracheostomy cuff inflated and deflated. Patients were fluoroscopically observed swallowing contrast-enhanced thin liquids, thick liquids, pureed food, and solid food. Each patient was to have undergone a total of 8 different swallowing studies. A radiologist blinded to cuff status was present to assess the degree of aspiration, which was graded from 0 (no aspiration) to 4 (aspiration of more than 10% of the ingested material with coughing). The study included 12 patients who had a total of 91 different swallowing studies. The full battery of eight swallowing studies could not be completed on every patient. When the cuff was inflated, the aspiration rate was 2.7 times higher (17.8% versus 6.5%). Logistic regression analysis revealed that cuff status and type of substance ingested were both predictors of aspiration ($P = 0.032$ and $P = 0.025$, respectively). Although the sample size was small, the nearly threefold increase in the aspiration rate associated with cuff inflation suggests feeding with the cuff deflated may be the preferred method. Solid foods are the safest. Swallowing studies may be the best method of assessing which substances will be tolerated by an individual patient.

Anaesthesia. 2004 Jul;59(7):652-7.

The effects of tracheostomy cuff deflation during continuous positive airway pressure

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Abstract:

Continuous flow positive pressure devices bridge the gap between mechanical and unsupported ventilation in patients recovering from critical illness. At this point, patients are often fully awake, yet the inflated tracheostomy cuff prevents them from speaking or swallowing. The aim of this study was to investigate the effects of cuff deflation. After ethics committee approval and informed consent, we recorded airway pressures with catheters placed 3 cm beyond the distal tracheostomy tip, respiratory rate, heart rate and peripheral oxygen saturation with continuous positive airway pressures set at 5, 7.5 and 10 cmH_2O with the cuff inflated and deflated. Sixteen patients completed the study. There were small falls in end expiratory pressureon cuff deflation. The median (interquartile range) pressure drop with set airway pressure of 5 cmH_2O was 0.25 (0-1.4) mmHg, which increased to 1 (0-3) mmHg at 7.5 cmH_2O and 1.5 (0-4) mmHg at 10 cmH_2O. These changes were not clinically significant and cardiopulmonary parameters remained stable. All patients were able to vocalize following cuff deflation. Twelve patients passed a blue dye swallow screen within a day of tolerating cuff deflation. These results suggest that pressures fall slightly following cuff deflation but this is associated with respiratory stability and may allow patients to talk and swallow.

Chest 1990; 97:679-83

Tracheostomy Ventilation. A Study of Efficacy with Deflated Cuffs and Cuffless Tubes

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Abstract:

The purpose of this study was to evaluate the effectiveness of long-term tracheostomy intermittent positive pressure ventilation (TIPPV) with deflated cuffs or cuffless tracheostomy tubes for patients with neuromuscular ventilator failure. One hundred four unweanable ventilator-dependent patients with neuromuscular ventilatory insufficiency were referred for pulmonary rehabilitation. Ninety-one of the 104 patients converted from TIPPV with an inflated cuff to either a deflated cuff (28 patients) or no cuff (63 patients). Arterial blood gas (ABG) and routine daytime monitoring of end-tidal Pco_2 were performed on all patients during this transition. In addition, periodic daytime and continuous overnight oximetry were performed on 21 of these patients receiving TIPPV with deflated cuffs or cuffless tubes. Thirteen of the 21 patients also had continuous overnight end-tidal Pco_2 monitoring. Despite a mean vital capacity of 17±12.3 percent and the fact that 16 of the 21 patients could tolerate only 60 minutes or less of autonomous respiration (free time), ABG, daytime SaO_2, and end-tidal Pco_2 were within normal limits for all 21 patients and mean overnight SaO_2 was 94 percent or greater for all except one patient who used a cuffless tracheostomy tube. Six patients experienced very transient desaturations below 90 percent but no one had a maximum end-tidal Pco_2 greater than 47 mm Hg. Patients with adequate pulmonary compliance and sufficient oropharyngeal muscle strength for functional swallowing and articulation are candidates for conversion to TIPPV with deflated cuffs or cuffless tracheostomy tubes despite little or no autonomous respiration.

Dysphagia. 1991;6(2):94-9.

Using Ventilators for Speaking and Swallowing

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Abstract:

An inflated cuff, although commonly thought to be required for the ventilator-dependent patient with a tracheostomy cannula, precludes speaking and has adverse implications for swallowing. Clinical trials with five ventilator-dependent, cognitively intact individuals with glottic control document that a deflated cuff is compatible with ventilation, preserves oral communication, and restores safe alimentation by mouth.