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Use of spirometry to evaluate breathing-swallowing coordination with solid foods

Deanna Britton, Ph.D., Jessica Thurman, A'amna Malik, Andrew Palmer, Donna Graville

OHSU-PSU School of Public Health

Keywords

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Abstract

INTRODUCTION

Breathing-swallowing coordination (BSC) is an important pulmonary defense that aids airway protection. However, commonly used measurement methods are prone to artifact and limited to measuring the presence and direction of airflow. Spirometry offers an alternate method to measure BSC with reduced artifact while also measuring air volume and flow. The purpose of this study is to determine the utility of using spirometry to measure BSC with solid food consistencies

METHODS

Ten healthy participants (6F, 4M; ages 20-43, mean 30) wore a head-mounted nasal mask (Philips Wisp) connected to a pneumotachograph (Hans Rudolph 3813) and spirometer (ADInstruments, Inc.) to collect airflow data during swallowing. Participants were observed with 3 bites of applesauce and 1 bite of cracker. Tidal breathing was measured for 3-5 cycles per swallow. Data were analyzed with LabChart 8.

RESULTS

Measurement of BSC was quick and easily tolerated. Consistent with prior literature, the average swallow apnea duration (SAD) with bites of applesauce was 0.94s (SD=0.69) with an expiratory/inspiratory respiratory phase pattern (RPP) in 93% of swallows. For bites of cracker, the average SAD was 0.75s (SD=0.22) and an expiratory/inspiratory RPP was observed in 80% of swallows. Additional measures of RPP volume and flow of air, expressed as a percentage of the participants' average tidal volume, were found to be much smaller than the average inspiratory tidal volume. For instance, with bites of applesauce, the average volume of the pre-SAD RPP was 0.14% (SD=0.11) and the post-SAD RPP was 0.40% (SD=0.23) of average tidal volume, respectively. With bites of cracker, the average volume of the pre-SAD RPP was 0.27% (SD=0.27) and the post-SAD RPP was 0.28% (SD=0.31) of average tidal volume, respectively.

CONCLUSIONS

Measurement of BSC via spirometry is valid, feasible and useful in describing additional characteristics of RPP.