Abstract

Objective: The tongue contributes to a safe swallow. It maintains a bolus in the oral cavity to prevent premature entry of the bolus into the hypopharynx, and the posterior aspect of the tongue helps generate pressure in the hypopharynx during swallowing. This study examined isometric tongue strength and tongue pressure measured during swallowing in healthy young and older adults.

Methods: Ninety-seven healthy individuals who were recruited as part of a larger study on swallowing participated in this study. Participants were divided into 3 age groups: 20-40 years, 41-60 years, and 61+ years. A KayPentax Digital Swallowing Workstation (KayPentax, Lincoln Park, NJ) with an air-filled bulb array was placed on the tongue of each participant (anterior to posterior). Participants completed 3 swallows and 3 isometric “tongue presses”.

Results: Repeated measures analyses of variance revealed a significant main effect of age (p = 0.01) and gender by location interaction (p = 0.02) for isometric tongue strength. That is, older adults had lower isometric tongue strength than young adults, and females had a greater difference between anterior and posterior tongue strength than males. Tongue strength during swallowing significantly differed only for tongue location with the anterior tongue generating greater swallowing pressure than the posterior.

Conclusion: This study comprises the largest number of healthy participants reported to date and confirms previous findings that isometric tongue strength decreases with age. Young and older adults generate similar swallowing pressures, which indicates that swallowing is a submaximal strength activity, and older adults have less functional reserve.

Introduction

- The tongue plays a pivotal role in swallowing, from bolus formation to propelling the bolus into the esophagus.
- Tongue strength is important to ensure a safe swallow. Appropriate strength is necessary to hold the bolus in the oral cavity until it is ready to be swallowed.\(^1\)
- Tongue pressure against the palate initiates the swallow, and the posterior tongue generates pressure to assist in the pharyngeal phase of swallowing.
- Isometric tongue strength (“tongue press”) has been reported to decrease with age.\(^2,4\)

Swallowing appears to be a submaximal task, and swallowing strength may not decrease with age. Accordingly, experimental questions of this study were:

1. Is isometric tongue strength lower in older adults?
2. Does swallowing tongue strength decrease with age?
3. Are there any differences between men and women for isometric or swallowing tongue strength?

Methods

Participants

- Ninety-seven healthy adults who were recruited as part of a larger swallowing study. Participants were divided into 3 age groups: 20-40 years, 41-60 years, and 61+ years.

Apparatus

- KayPentax Digital Swallowing Workstation (KayPentax, Lincoln Park, NJ)
- Air-filled bulb array (anterior, middle, posterior bulbs)

Procedure

- Bulb array was placed on palate so that the anterior bulb lined up with the alveolar ridge of the hard palate.
- Participants were seated upright, and instructed to perform 3 isometric “tongue presses” by pressing the tongue against the palate.
- Each participant then completed 3 dry (saliva) swallows.
- The 3 trials for each task were averaged.
- Pressure values were measured in mm Hg.

Results

Isometric tongue strength decreased with age (p = 0.01). Women demonstrated a greater difference between anterior and posterior isometric strength than men (p = 0.02). There were no differences in swallowing tongue strength according to age or gender. Swallowing tongue strength differed only by location: more pressure was generated at the anterior bulb than at the posterior bulb for both genders and age groups.

Conclusions

The decrease in isometric tongue strength with age is a robust finding in this large cohort of healthy adults. The lack of a decrease in swallowing strength in older adults suggests swallowing is a submaximal task, and that older adults lose some functional reserve as a result of decreased isometric tongue strength.

References