Braz J Otorhinolaryngol. 2016;82(1):39–46

Brazilian Journal of
OTORHINOLARYNGOLOGY
www.bjorl.org

ORIGINAL ARTICLE

Acoustic analysis of oropharyngeal swallowing using Sonar Doppler☆,☆☆

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Received 25 March 2014; accepted 27 February 2015
Available online 17 December 2015

KEYWORDS
Deglutition;
Elderly;
Evaluation

Abstract
Introduction: During the aging process, one of the functions that changes is swallowing. These alterations in oropharyngeal swallowing may be diagnosed by methods that allow both the diagnosis and biofeedback monitoring by the patient. One of the methods recently described in the literature for the evaluation of swallowing is the Sonar Doppler.
Objective: To compare the acoustic parameters of oropharyngeal swallowing between different age groups.
Methods: This was a field, quantitative, study. Examination with Sonar Doppler was performed in 75 elderly and 72 non-elderly adult subjects. The following acoustic parameters were established: initial frequency, first peak frequency, second peak frequency; initial intensity, final intensity; and time for the swallowing of saliva, liquid, nectar, honey, and pudding, with 5- and 10-mL free drinks.
Results: Objective, measurable data were obtained; most acoustic parameters studied between adult and elderly groups with respect to consistency and volume were significant.
Conclusion: When comparing elderly with non-elderly adult subjects, there is a modification of the acoustic pattern of swallowing, regarding both consistency and food bolus volume.

☆ Please cite this article as: Soria FS, da Silva RG, Furkim AM. Acoustic analysis of oropharyngeal swallowing using Sonar Doppler. Braz J Otorhinolaryngol. 2016;82:39–46.
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http://dx.doi.org/10.1016/j.bjorl.2015.12.001

PALAVRAS-CHAVE
Deglutição;
Idoso;
Avaliação

Análise acústica da deglutição orofaríngea utilizando Sonar Doppler

Resumo
Introdução: Durante o processo de envelhecimento, uma das funções que sofre modificação é a deglutição. Estas alterações na deglutição orofaríngea podem ser diagnosticadas por métodos que permitem tanto o diagnóstico quanto o monitoramento e biofeedback ao indivíduo. Um dos métodos descrito na literatura recentemente para a avaliação da deglutição é o Sonar Doppler.
Objetivo: O objetivo desse estudo foi comparar os parâmetros acústicos da deglutição orofaríngea entre faixas etárias distintas.
Método: Estudo de campo, quantitativo. O exame com o Sonar Doppler foi aplicado em 75 idosos e 72 adultos. Estabeleceram-se os parâmetros acústicos: frequência inicial, frequência do primeiro pico, frequência do segundo pico, intensidade inicial, intensidade final e tempo, para as deglutições de saliva, liquido, néctar, mel e pudim, com gole livre, 5 mL e 10 mL.
Resultados: Obtiveram-se dados objetivos e mensuráveis, apresentando significância para a maioria dos parâmetros acústicos estudados entre o grupo de idosos e adultos em relação à consistência e volume.
Conclusão: Verificamos que há modificação do padrão acústico da deglutição, tanto em relação à consistência quanto a volume do bolo alimentar, quando comparados adultos idosos e não idosos.

Introduction

The world's elderly population is increasing considerably; in 2025, it will exceed the number of children. Therefore, such individuals deserve the attention of interdisciplinary health-care teams; these professionals need to acquire a better understanding of the aging process and its impact on the individual's health, aiming mainly at improving the quality of life of this population, as well as proposing measures to prevent possible clinical complications.[1,2]

During the aging process, one of the functions that changes is swallowing. Swallowing disorders associated with aging can be conceptualized as presbyphagia.[3] However, swallowing disturbances caused by neurological and/or structural diseases are called dysphagia; both these disorders and presbyphagia may result in changes of the clinical condition of the patient,[4,5] possibly with changes in the oral, pharyngeal, and esophageal phases of swallowing. In the oral and pharyngeal phases an increase in the time of bolus transmission occurs, and the same is observed in the esophageal phase, which is associated with a high frequency of non-propulsive contractions.[6,7]

These changes in oropharyngeal swallowing may be diagnosed by methods that allow for both diagnosis and biofeedback monitoring, and thus aid in treatment. These methods include video fluoroscopy, nasal endoscopy, and cervical auscultation.[8,9]

Another method recently described in the literature for the evaluation of swallowing is the Sonar Doppler, which may become a valuable test for assessing swallowing, as it is a painless, noninvasive, and inexpensive test that does not expose the patient to radiation.[10–12]

This study aimed to compare the acoustic parameters of oropharyngeal swallowing between different age groups.

Methods

This research was conducted in two stages. In the first step, a questionnaire (Risk Screening Protocol for Swallowing) that contained questions related to risk factors for dysphagia was administered (Appendix 1). Volunteers who presented risk factors for dysphagia were excluded (with neurological disease, head and neck structural changes, exposition to radiotherapy and/or chemotherapy, and those with swallowing complaints). In total, 189 questionnaires were administered; 147 individuals were selected and participated in the second stage of the research, and were divided into two groups. Group I (GI) consisted of 75 healthy elderly people, aged >60 years, with a mean age of 71 years. Group II (GII) consisted of 72 healthy adult subjects aged between 18 and 59 years, with a mean age of 42 years.

In the second phase, the participants were submitted to the evaluation of oropharyngeal swallowing with Sonar Doppler. The assessment followed the protocol proposed by Santos and Macedo-Filho,[10] with modifications regarding specifications of consistency. The protocol classifies the swallowing of saliva, liquids, and pastes. In the present study, the classification of the National Dysphagia Diet Guidelines (2002)[13] proposing liquid, nectar, honey, and pudding was used, with the addition of saliva swallows (Fig. 1).

All study subjects received the same food consistency during the procedure, divided into dry swallowing (saliva) and liquid, nectar, honey, and pudding swallowing, using volumes in the sequence described: 5 mL-, 10 mL-, and free swallows. In the sequence described, four swallows were required: firstly, saliva swallowing, followed by free-, 5 mL- and 10 mL-swallows of each consistency.

The consistencies were prepared with the Nutillis® thickener (a food thickener consisting of corn starch and food