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Amplitude and speed of masticatory movements in total laryngectomy patients☆

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KEYWORDS
Electrophysiology;
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Abstract
Introdution: Laryngectomy is a surgical procedure that aims to remove the hyoid bone and the larynx and its muscles; it is inferred that a destabilization of the hyoid-mandibular axis will occur, consequently changing chewing.
Objective: To characterize the amplitude and speed of chewing in laryngectomies and to compare them with two groups of non-laryngectomized individuals differentiated by age.
Method: 72 volunteers were divided into three groups: (A) 32 volunteers, mean age 22.3 years, 17 females; (B) 20 volunteers, mean age 53.2 years, 10 females, and (C) 20 volunteers who underwent total laryngectomy, mean age 61.5 years, one female. Electrognathography, a method that tracks and measures millimeter jaw movements, was used for evaluation.
Results: Significant diferences were observed between groups A and C in masticatory amplitude and speed.
Conlcusion: Age, and adaptive and compensatory changes appear to explain chewing better than factors related to total laryngectomy.

PALAVRAS-CHAVE
Eletrofisiologia;
Idoso;
Reabilitação

Amplitude e velocidade dos movimentos mastigatórios em indivíduos laringectomizados totais

Resumo
Introdução: A laringectomia é um procedimento que objetiva a retirada do osso hiode, da laringe e seus músculos, e, com isso acredita-se que ocorra uma desestabilização do eixo hióideo-mandibular, com consequente alteração na mastigação.
Objetivo: Caracterizar a amplitude e a velocidade mastigatória em laringectomizados e compará-las com dois grupos de indivíduos não laringectomizados, de acordo com a faixa etária.
Método: Participaram do estudo 72 voluntários, que foram divididos em três grupos: (A) 32 voluntários, não laringectomizados com idade média de 22,3 anos, sendo 17 do sexo feminino; (B) c20 voluntários não laringectomizados, idade média de 53,2 anos, dos quais 10 eram do sexo

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feminino; e (C) 20 voluntários submetidos à laringectomia total, idade média de 61,5 anos, sendo um do sexo feminino. Para a avaliação foi utilizada a eletrognatografia, que é um método objetivo e não invasivo que rastreia e mensura milimetricamente os movimentos mandibulares.
Resultados: Foram encontradas grandes diferenças entre os grupos A e C na velocidade e amplitude mastigatória, e essas diferenças foram significativas.
Conclusão: Fatores etários, adaptativos e compensatórios parecem explicar melhor as alterações mastigatórias do que fatores relacionados à laringectomia total.

Introduction

Total laryngectomy is a method for the surgical treatment of laryngeal cancer. The procedure is characterized by a complete larynx removal, from the base of the tongue to the trachea, including the hyoid bone and the pre-epiglottic space,[1-3] implying the mutilation of various systems and consequent alteration of their functional characteristics, such as in the stomatognathic system.[4,5]

The mutilations between the supra and infra-hyoidal regions that connect the jaw, hyoid bone, and external and clavicle[2,6] directly interfere with the function of the stomatognathic system, leading the patient to develop compensatory neuromuscular parafunctions with the remaining muscular structures.[7,8] These parafunctions represent the intricate impact on mandibular biomechanics derived from damage to structures that belong or are related to the stomatognathic system.[9-11] One way to analyze these biomechanics is the measurement of amplitude and velocity of jaw movements, using predictive variables such as kinematic changes. In this context, electrognathography (EGN), a method tracks movements using magnetoresistive sensors, can be an excellent way to obtain these data.[12,13]

The measurement of amplitude and speed of movements related to the mandibular biomechanics of total laryngectomy patients has not yet been reported in the literature. The importance of this work was the quantitative data survey, which can support, reconfigure, or assist multidisciplinary therapeutic programs targeted at this issue.

This study aimed to characterize the amplitude and speed of masticatory cycles on total laryngectomy patients evaluated by electrognathography and to compare these data with those of two other groups of non-laryngectomized individuals differentiated by age.

Methods

This was a cross-sectional, observational, exploratory, case series study with comparison groups, conducted between February and July of 2012. It included patients treated with total laryngectomy and volunteers without cirugical interviwe on neck or head. In addition to these study sites.

The main criteria adopted were patients in the postoperative period restricted to total laryngectomy with neck dissection, in the absence of recent post-operative complications or difficulty in understanding simple instructions. The study population comprised 20 patients with mean age of 61.5 years and mean postoperative period of 3.65 years, one (5%) of whom was a female (group C).

The type of sample was defined by the characteristics of the group of non- laryngectomized subjects. For this reason, non-probabilistic sampling was adopted, by accessibility or convenience; it builds on the subject specificity and allows them to represent the universe, by being descriptive and exploratory.[14]

To determine the sample size of the comparison groups, identified as young-adult group (group A) and adult group (group B), a ratio of 1.6:1.0, 0.05 significance level, and 80.0% power of evidence were assumed. This estimated a sample of 31 individuals in group A and 19 in group B; adequate estimates for the group B retained more characteristics similar to the universe of laryngectomy patients.[15]

Groups A and B had as common inclusion criteria: individuals of both genders; dentate or partial or total edentulous, with or without a prosthetic or orthodontic mouthparts; not submitted to surgery in the head and neck regions; no complaints of dysphagia; not subjected to any physical therapy and/or speech treatment; and no difficulty in understanding simple commands. Exclusion criteria for groups A and B were presence of neurological, neuromuscular, or neurodegenerative diseases, and clinical diagnosis of acute symptoms of temporal-mandibular disorders at the time of testing.

The differential inclusion criteria between groups A and B was age. Group A included young adults aged between 18 and 29 years; in group B, subjects were aged 40 or older.

72 individuals of both genders participated in the study, with the following distribution: group A comprised 32 volunteers, mean age equal to 22.3 years; group B comprised 20 volunteers, mean age 53.2 years; group C consisted of 20 patients who underwent total laryngectomy.

Phases of data collection

After reading and signing the informed consent, volunteers underwent history and specific physical exams.

For the electrognathographic examination, the volunteer was instructed to sit comfortably in a chair with the head erect and eyes directed forward.

An electrognathographer, model JT-3D® (BioRESEARCH), was used; the collected data was analyzed using BioPak System.

In the collection of electrognathography parameters, a small magnet was originally fixed to the labial surface of the lower incisors corresponding to the midline level; the head