CLINICS

RAPID COMMUNICATION

Adolescents with HIV and facial lipoatrophy: response to facial stimulation

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OBJECTIVES: This study evaluated the effects of facial stimulation over the superficial muscles of the face in individuals with facial lipoatrophy associated with human immunodeficiency virus (HIV) and with no indication for treatment with polymethyl methacrylate.

METHOD: The study sample comprised four adolescents of both genders ranging from 13 to 17 years in age. To participate in the study, the participants had to score six or less points on the Facial Lipoatrophy Index. The facial stimulation program used in our study consisted of 12 weekly 30-minute sessions during which individuals received therapy. The therapy consisted of intra- and extra-oral muscle contraction and stretching maneuvers of the zygomaticus major and minor and the masseter muscles. Pre- and post-treatment results were obtained using anthropometric static measurements of the face and the Facial Lipoatrophy Index.

RESULTS: The results suggest that the therapeutic program effectively improved the volume of the buccinators. No significant differences were observed for the measurements of the medial portion of the face, the lateral portion of the face, the volume of the masseter muscle, or Facial Lipoatrophy Index scores.

CONCLUSION: The results of our study suggest that facial maneuvers applied to the superficial muscles of the face of adolescents with facial lipoatrophy associated with HIV improved the facial area volume related to the buccinators muscles. We believe that our results will encourage future research with HIV patients, especially for patients who do not have the possibility of receiving an alternative aesthetic treatment.

KEYWORDS: Speech; Language and Hearing Sciences; HIV; Associated Lipodystrophy Syndrome; Therapeutics.

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INTRODUCTION

The increased survival experienced by human immunodeficiency virus (HIV) infected patients after the advent of highly effective antiretroviral therapies has been accompanied by the frequent occurrence of chronic metabolic abnormalities, such as HIV-related lipodystrophy (1-5). Facial lipoatrophy associated with HIV has become epidemic and can be cosmetically disfiguring (6). The observed symptoms are peripheral fat wasting with a loss of subcutaneous tissue on either side of the face (temporal and maxillary wasting) (Figure 1). These physical symptoms might stigmatize the individual as one living with HIV infection, a worrisome complication due to its negative psychological impact on mood, self-esteem and adherence to treatment (2). The purpose of the present study was to verify the effects of facial stimulation through maneuvers that promote muscle contraction and stretching over the superficial muscles of the face of adolescents with facial lipoatrophy associated with HIV and no indication for treatment with polymethyl methacrylate (PMMA) infiltration.

MATERIALS AND METHODS

An observational, descriptive case study was conducted with adolescents with HIV. The study design was approved by the Ethics Committee for the Analysis of Research Projects (CEP-HUPE no. 2411). Prior to enrollment, all participants were informed of the purpose and procedures and all participants provided their informed consent.

The initial study sample was composed of nine adolescents of both genders ranging from 13 to 17 years in age. The individuals were recruited from a Brazilian HIV Program

No potential conflict of interest was reported.

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Figure 1 - patient with facial lipoatrophy associated with HIV.

Treatment Center that offers free and universal access to antiretroviral therapy. The participants were eligible if they met the following criteria: received a medical diagnosis of HIV acquired through mother/child transmission; were receiving continuous retroviral therapy; presented an undetectable viral load; did not previously receive PMMA infiltration treatment; scored six or less points on the Facial Lipoatrophy Index (FLI) (6); and presented no history of head and neck trauma or surgery. According to Brazilian legislation, although the use of PMMA for treating facial lipoatrophy associated HIV is indicated for individuals above 12 years of age, there is a national consensus that this material should be used with caution in adolescents. Craniofacial development can still be observed in adolescents and can occur until the end of this phase (i.e., approximately 18 years of age) (7). The use of permanent fillers for aesthetic purposes is recommended only after craniofacial growth has ended to avoid new surgical interventions and new aesthetic procedures. Of the nine patients who were referred for facial stimulation therapy, only four completed the treatment proposal (Figure 2).

To avoid possible variations in the applied therapy techniques, all of the participants were assessed and treated by the same speech-language pathologist (SLP). The SLP performing the facial assessment and delivering treatment successfully passed specific training tests.

The treatment effects were assessed pre- and post-treatment using the following measurements:

1. Anthropometric measurement of the face (8,9);
2. Facial Lipoatrophy Index (FLI) (6).

Anthropometry is the biological science of measuring the size, weight and proportion of the human body (8) and provides objective data regarding craniofacial morphology through a series of head and face measurements (10). For the present study, we selected the following static measurements (Figure 3: The images presented are from one of the participants): (a) medial portion of the face – the diagonal distance from the external corner of the eye to the commissure (mouth); (b) lateral portion of the face – the diagonal distance from the tragus (ear) to the end point of the nasolabial fold projection on the mandible (i.e., measurements a and b estimate the volumes of the buccinator and masseter muscles, respectively); (c) masseter muscles– the horizontal distance from the center of the left masseter to the center of the right masseter (the muscle center point is estimated by asking the patient to clench their teeth to produce muscle contraction and determined by palpation of the region with maximal volume); (d) buccinators muscles - the horizontal distance from the center of the left buccinator to the center of the right buccinator (muscle center point is determined by measuring the midpoint between the external corner of the eye and the commissure).

The measurements were performed using a digital caliper (Digimess, Pró-Fono). The individuals were examined while sitting on a chair with their heads positioned horizontally according to the Frankfort plane. Prior to performing the measurements, the landmarks were identified on the face

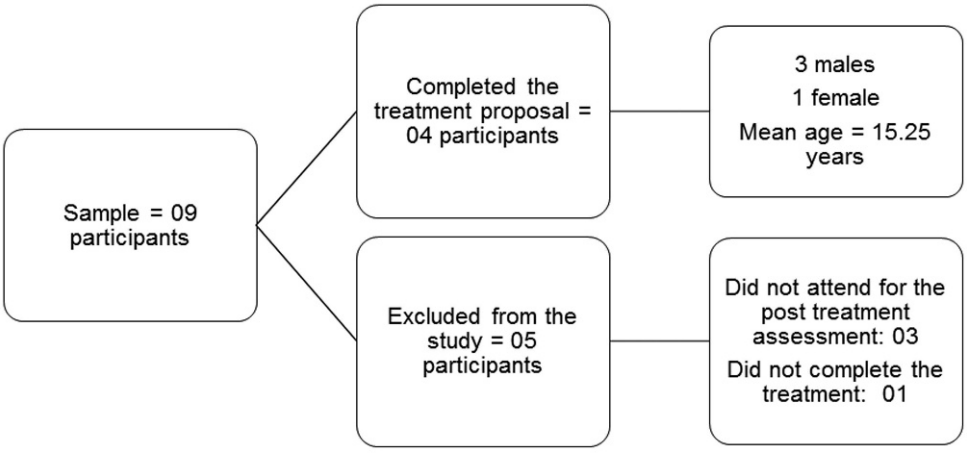

Figure 2 - Sample characterization.

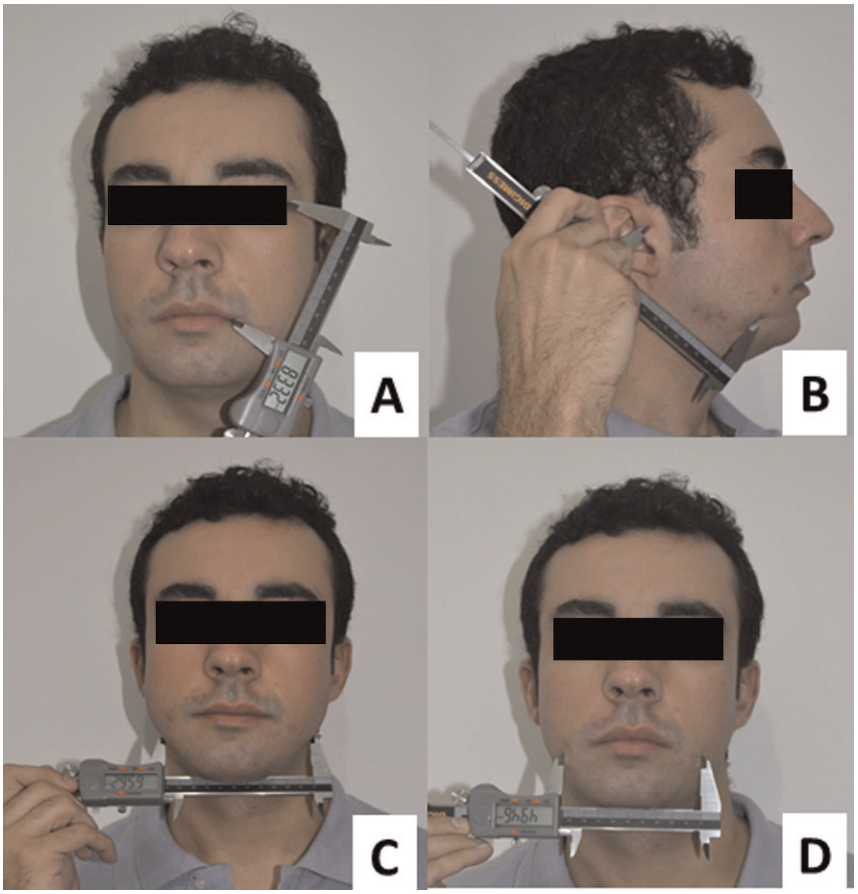

Figure 3 - Anthropometric measures: A = medial portion of the face; B = lateral portion of the face; C = masseter; D = buccinators.

using a marking pen. The measurements of each location were repeated to ensure reliability. However, if a difference greater than 25% was observed among any set of measurements, the data were collected again.

The FLI (6) is a clinical evaluation developed by Brazilian doctors that aims to estimate the levels of facial atrophy and improvement with treatment. The FLI evaluates three facial regions separately (i.e., malar, temporal and pre-auricular regions) and the score ranges from 0 to 20 points. To determine the level of atrophy, two characteristics (depth and extension) of facial atrophy are observed. The depth of atrophy is graded from 0 to 4 (0, absence of atrophy; 1, mild; 2, moderate; 3, severe; 4, very severe). The extension of the involved area is graded from 0 to 5 (0, absence of involvement; 1, less than 20% involvement; 2, 21 to 50% involvement; 3, 51-70% involvement; 4, 71 to 90% involvement; 5, 91 to 100% involvement).

A partial number is calculated for each evaluated area, and then each number is multiplied by the depth grading of the involved area and by a correction factor. The correction factor was specified for each facial region and corresponds to the level of importance of each region for facial atrophy. The following correction factors were used: 0.7 for the malar region, 0.2 for the temporal region and 0.1 the pre-auricular region. The partial grades of the three regions are added to determine the final grade. Given that the loss of fat is not symmetrical, the side of the face that is mostly compromised determines the final score on the FLI. Based on the FLI, the Brazilian Ministry of Health (11) classifies facial lipoatrophy from levels I to IV: Level I (mild facial atrophy), 0 to 5.9 on the FLI; Level II (moderate facial atrophy), 6.0 to 10.0 on the FLI; Level III (severe facial atrophy), 10.1 to 15 on the FLI; Level IV (very severe facial atrophy), 15.1 to 20 on the FLI. The Ministry of Health recommends medical treatment for HIV patients with facial lipoatrophy only when they present with 6 or more points on the FLI.

After the initial evaluation, all of the participants underwent a facial stimulation treatment program (12-15). The treatment program, which formed an integral part of the current study, consisted of 12 weekly 30-minutes sessions. The individuals each received therapy, which included:

1. Intra- and extra-oral muscle contraction and stretching maneuvers of the zygomaticus major and minor and the masseter muscles (16-18);
2. Individuals were strongly encouraged to perform the presented muscle contractions and stretching maneuvers three times a day outside the clinic environment. Practice consisted of four series of eight repetitions for each maneuver. Participants were instructed to maintain a diary to record their compliance with the given instructions.

Four participants completed the intervention program and both evaluations. The results from these individuals were considered for statistical analyses. The Shapiro-Wilk test indicated that the data followed a normal and homogeneous distribution. For this reason, the paired

Student's *t*-test was used for pre- and post-treatment comparisons ($p<0.05$).

RESULTS

The results are presented in Table 1. The data analyses indicated significant pre- and post-treatment variations for the buccinator measurements. No significant differences were observed for the other comparisons.

DISCUSSION

Body image changes can be extremely disturbing to a person's psychosocial well-being and might enhance the stigma of living with HIV (6). Additionally, body image changes can trigger disturbances in social relations, leading to the social isolation of the patient (2,19). Facial lipoatrophy has a large psychological impact and can reduce the patient's complacency with the treatment (6).

The results of our study suggest that facial maneuvers applied to the superficial muscles of the face of adolescents with facial lipoatrophy associated with HIV improved the volume of the facial area related to the buccinators. The body of literature on motor behaviors indicates that motor patterns are mediated by central neuronal circuits known as Central Pattern Generators (CPGs). Currently, several CPGs are under analysis. The literature has suggested a large amount of variability in the cell and synaptic properties and that different neuronal networks are interrelated to produce the final characteristics of movements (20-23). Peripheral orofacial sensory inputs can alter the excitability of the inferior facial motor neurons and can contribute to movement control. When applying training exercises/muscle maneuvers, it is important to know that modifications in strength are generally the result of modifications in how the nervous system activates the muscle rather than structural alterations in the muscle itself (24,25). The current evidence suggests that the neuromotor system can suffer modifications due to experiences and that restructuring can either occur at the central or peripheral level (24).

Although our study has limitations due to sample size, we strongly believe that our results will encourage future research with HIV patients, especially those who live with the stigma of HIV and do not have the opportunity to receive an alternative aesthetic treatment. Since anthropometry cannot measure regional fat, we suggest the use of more objective measurements, such as ultrasound, to measure the absolute values of regional fat. To our knowledge, this is the first study to investigate whether the facial appearance of patients with lipoatrophy associated with HIV can be improved.

Table 1 - Summary of the anthropometric measurements and FLI scores.

Variable (mm)	Mean	SD	*p*-value
Medial portion of the face RS - Pre	72.00	6.16	0.173
Medial portion of the face RS – Post	73.95	5.31	
Medial portion of the face LS – Pre	73.00	5.72	0.149
Medial portion of the face LS – Post	74.91	3.95	
Lateral portion of the face RS – Pre	89.33	8.33	0.104
Lateral portion of the face RS – Post	92.70	7.15	
Lateral portion of the face LS – Pre	89.64	6.56	0.356
Lateral portion of the face LS – Post	91.91	3.56	
Buccinator – Pre	80.71	2.18	0.007*
Buccinator - Post	83.49	2.71	
Masseter – Pre	108.16	3.37	0.214
Masseter – Post	115.32	6.41	
FLI – Pre	3.85	1.88	0.428
FLI - Post	3.40	1.92	

FLI: Facial Lipoatrophy Index; mm: millimeters; RS: right side; LS: left side; Pre: pre-treatment assessment; Post: post-treatment assessment;
*: significant result.

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AUTHOR CONTRIBUTIONS

Gabana-Silveira JC was involved in data collection and analysis, interpretation of the results, and manuscript writing. Mangilli LD participated in organizing and conducting the statistical analyses, interpretation of the results, and writing a major portion of the paper. Sassi FC was responsible for gathering and analyzing data, and conducting the statistical analyses. Braga AF was responsible for the medical criteria adopted in the experimental design and contributed to data analysis and manuscript preparation. Andrade CR was responsible for the research and experimental design and contributed to data analysis and manuscript preparation.

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