Original Article

Artigo Original

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Functional change in the pattern of swallowing through the performance of orofacial exercises

Mudança funcional no padrão de deglutição por meio da realização de exercícios orofaciais

Keywords

Speech, Language and Hearing Sciences
Deglutition
Deglutition Disorders
Rehabilitation
Exercise Therapy

ABSTRACT

Purpose: The objective was to determine if there was functional improvement of swallowing pattern in subjects identified with risk of oropharyngeal dysphagia after four weeks of specific oropharyngeal exercises. These exercises have pre-determined intensity and duration. **Methods**: It is a longitudinal study of functional effect, determined by initial and final comparative measures. Participants were adults and elderly, selected in a period of 24 months. A total of 68 participants were included. All subjects had a clinical evaluation of swallowing, and an initial measure in a functional scale. The individuals were split into two groups, according to the initial levelling of ASHA NOMS scale. In Group 1 (G1) - ASHA NOMS, initial of levels 1 and 2; Group 2 (G2) - ASHA NOMS, initial of levels 3, 4 and 5. All subjects executed an exercise protocol performed for four weeks. The protocol includes sessions with a speech therapist, and continuity of activities in home environment. Finally, new measurement of swallowing performance was held. **Results:** For G2 group there was statistically significant improvement. For G1, the relation was insignificant, despite the intense change in ASHA NOMS scale, however, in this group there was a reduced number of individuals due to the profile severity. **Conclusion**: The program was effective because after four exercise sessions, there was significant improvement in swallowing pattern, demonstrated by functional scale.

Descritores

Fonoaudiologia
Deglutição
Transtornos de Deglutição
Reabilitação
Terapia com Exercício

RESUMO

Objetivo: O objetivo desta pesquisa foi verificar se há melhora funcional do padrão de deglutição em indivíduos identificados com risco para disfagia orofaríngea após quatro semanas da realização de exercícios orofaríngeos específicos com intensidade e duração pré-determinados. **Método:** Esta pesquisa é de caráter longitudinal de efeito funcional, determinado por medidas comparativas inicial e final. A população-alvo foi constituída de indivíduos adultos e idosos selecionados por 24 meses. Foi incluído para esta pesquisa um total de 68 indivíduos. Foi realizada avalição clínica da deglutição e observados sinais clínicos para disfagia. Os indivíduos foram divididos em dois grupos de acordo com o nivelamento inicial na escala ASHA NOMS. No Grupo 1 (G1) – ASHA NOMS, inicial de níveis 1 e 2; Grupo 2 (G2) – ASHA NOMS, inicial de níveis 3, 4 e 5. Todos os indivíduos realizaram um protocolo de exercícios por quatro semanas. O protocolo conta com sessões presenciais e continuidade das atividades em ambiente domiciliar. Ao final, foi realizada nova mensuração do desempenho de deglutição. **Resultados:** Para o grupo G2 houve melhora estatisticamente significante. Para o G1, a relação não foi significante, apesar de mudança intensa na escala ASHA NOMS, porém, neste grupo, temos um número reduzido de indivíduos devido à gravidade do perfil. **Conclusão:** O programa se mostrou efetivo, pois, após as quatro sessões de exercícios, houve melhora importante no padrão de deglutição, demonstrada pela escala funcional.

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INTRODUCTION

Dysphagia is a condition that potentially affects risk of life and arises from a variety of disorders that affect the neural, motor and/or sensorial systems that determine the deglutition function[1]. Swallowing alterations, apart from etiology, can lead to potential health risks which include malnutrition, lung infection and death[1].

Due to population aging and the increase on the number of people affected by diseases that lead to swallowing alterations, the early identification and management of dysphagia must be a priority to reduce the risk of severe complications and improve the results with vulnerable populations[2].

Besides using adaptations at the moment of oral intake, it has been suggested a variety of exercise protocols to improve the swallowing capacity aiming at larger range of movement[3], increase at the swallowing effort[4-6] and sensorial system impulse[7].

Among them are *tongue-hold*[8,9], Shaker exercise[10], counter-resistance exercise with head lowered[11], tongue exercises[12], *Iowa Oral Performance Instrument* – IOPI[13], etc.

Some studies[14-16] have shown a motor reorganization map as a feedback for therapeutic stimulation. These studies also suggest that a pattern containing training duration and intensity levels is necessary to maximize central and peripheral adaptation.

The application of exercises provides not only muscular strengthening in the suprahyoid and pharyngeal regions, but also allows swallowing functional improvement[17], presenting better performance with different food consistencies.

The objective of this research was to check if there is functional improvement of the swallowing pattern after four weeks performing specific oropharyngeal exercises with pre-determined duration and intensity.

METHODS

It is a longitudinal study of functional effect, determined by initial and final comparative measures. All the individuals signed the consent form informed to participate in this study, which was approved by the Comitê de Ética da Universidade de São Paulo, Brazil (CAPPesq HCFMUSP 522.347).

The target population were adult and elderly individuals, addressed for speech language therapy evaluation and treatment in an ambulatory connected to a tertiary hospital. The selection period was of 24 months. The base diagnoses, as well as their severity, were determined by the medical team from the original addressing. They excluded individuals with basic neurological pathologies, elderly with cognitive decline, with surgeries of head and neck tumor resection, tracheostomized, who presented cricopharyngeal dysfunction or that showed initial level at ASHA NOMS[18] scale of 6 or 7, once they already present swallowing functionality.

The criteria for the participants' inclusion were: medical forwarding for speech language therapy intervention; diagnosis of oropharyngeal dysphagia risk, according to speech language therapy clinical protocols; being or not using alternative food intake; not having been submitted to speech language therapy for oropharyngeal dysphagia for the last three months; presence at the sessions higher than 90%; having been able to follow the speech language therapy guidelines suggested during the live sessions.

At the end of 24 months, 343 individuals were selected. Among them, 253 were excluded because they did not fit the inclusion criteria. A total of 22 were excluded because they did not adhere to the treatment. The sample comprised 68 individuals.

PROCEDURES

Initial evaluation

For the swallowing clinic evaluation, it was applied the standard protocol. PARD – speech language therapy protocol on dysphagia[19] risk evaluation is a Brazilian assessment protocol idealized to dysphagia risk early diagnosis. In our hospital this is the standard protocol used to evaluate patients' swallowing disability. This protocol includes items previously described as being efficient at the identification of high risk patients to dysphagia[20,21].

To identify the functional change, levelling was performed at the ASHA NOMS scale for swallowing[18]. ASHA NOMS scale was developed to measure, at each session, the functional improvement in the different speech language therapy areas. It is divided into seven levels that vary from one to seven. The lowest punctuation indicated higher compromising of the swallowing functionality. International literature[22,23] has already used this measuring as an indicator of the swallowing standard improvement.

The individuals were split into two groups, according to the initial levelling of ASHA NOMS scale. In Group 1 (G1) - ASHA NOMS, initial of levels 1 and 2; Group 2 (G2) - ASHA NOMS, initial of levels 3, 4 and 5.

At the initial evaluation, were punctuated the clinical signs of tracheal penetration/aspiration observed at the protocol application, and also performed levelling of ASHA NOMS scale for swallowing. After the sessions performance, it was applied the same initial protocol, as well as new levelling of ASHA NOMS scale.

Strategies

Independently on the allocated group, all the individuals performed the same number of sessions, as well as the same procedures. All the performed procedures are described on Chart 1.

The presential sessions of thirty minutes each, happened weekly for four weeks, with speech language therapist specialized on the oropharyngeal dysphagia treatment.

After each session, the individual received a form for home monitoring with the activities to be performed at home until next session. These activities were the same performed during the presential session and should be repeated three times a day. The use of this form as well as the patient/caregiver's report allowed the therapist a feedback on the strategies adhesion performed at home.

The intrajudge reliability measures were obtained for both the initial and final evaluation by means of Sander formula for agreement index. The reliability between the researcher and the

Chart 1. Description of the performed procedures

Procedure	Training
Session 1	
The participant is guided to say "CA" in high vocal intensity.	3 sets of 10 repetitions. 30-second interval between the sets.
The participant is instructed to perform vertical and horizontal movements with the tongue.	3 sets of 10 repetitions for each movement. 30-second interval between the sets.
It is instructed to the patient to perform maximum tongue protrusion sustaining for three seconds.	3 sets of 5 repetitions. 30-second interval between the sets.
The participant is guided to say "RA" with sputum movement.	3 sets of 10 repetitions. 30-second interval between the sets.
Session 2	
The participant is guided to say "CA" in high vocal intensity, while performing shove movement with the hands in hooking.	3 sets of 10 repetitions. 30-second interval between the sets.
The participant is instructed to perform vertical and horizontal movements with the tongue, sustaining for three seconds at each movement.	3 sets of 10 repetitions for each movement. 30-second interval between the sets.
It is instructed to the patient to perform maximum tongue protrusion sustaining for five seconds.	3 sets of 10 repetitions. 30-second interval between the sets.
The participant is guided to say "RA" with sputum movement.	3 sets of 10 repetitions. 30-second interval between the sets.
Session 3	
The participant is guided to say "ZA", extending "Z" the maximum possible.	3 sets of 10 repetitions. 30-second interval between the sets.
The participant is guided to position the tongue in cheek, with occluded lips and perform counter resistance with the forefinger.	3 sets of 5 repetitions for each side. 30-second interval between the sets.
It is instructed to the patient to perform vocal glissando, with "I", starting with low pitched tone and evolving to high pitched.	3 sets of 5 repetitions. 30-second interval between the sets.
The participant is guided to hold the tongue among the teeth and swallow saliva (tongue-hold).	3 sets of 5 repetitions. 30-second interval between the sets.
Session 4	
The participant is guided to say "Z", the longest the possible.	3 sets of 10 repetitions. 30-second interval between the sets.
The participant is guided to position the tongue in cheek, with occluded lips and perform counter resistance with the forefinger.	3 sets of 10 repetitions. 30-second interval between the sets.
It is instructed to the patient to perform vocal glissando, with "I", starting with low pitched tone and evolving to high pitched.	3 sets of 10 repetitions for each side. 30-second interval between the sets.
The participant is guided to hold the tongue among the teeth and swallow saliva (tongue-hold).	3 sets of 10 repetitions. 30-second interval between the sets.

judge (speech language therapist with specialization in the area of dysphagia) varied from 0.94-0.97. The intrajudge reliability varied from 0.91-0.97. There was level of agreement in the study.

RESULTS

68 individuals were included, according to the pre-established criteria. The average age was 59.4, with standard deviation of 17.4. From the analyzed individuals, 29.4% had alternative food intake at the initial phase.

As base diagnostics there are: lung diseases (21.8%); gastrointestinal cancer or lymphoma (7.3%); hepatopathies (2.2%); kidney diseases (0.8%); liver and kidney transplants (2.8%); cardiopathies (12.4%); rheumatology disorders (14.4%); gastroenterological diseases (14.4%); infectious diseases (6.6%); others (17.3%).

On Table 1, the individuals are presented according to the level of ASHA NOMS scale, initial and final, per group. In both groups, there were changes in the scale levels after the performance of the exercises. 82.35% in both groups, got to reach on ASHA NOMS scale, level above or equal to 6.

Table 2 presents dysphagia signs found in the groups. One participant may have presented more than one risk sign at the clinic evaluation. The risk signs considered were: wet voice, multiple swallowing; cough; choking and noisy cervical auscultation. The symptom that remained common in the groups was the presence of multiple swallowing at the end.

Table 1. Distribution of the individuals according to the level of ASHA NOMS scale

Groups	ASHA NOMS	
	Initial level ≤ 5	Final level ≥ 6
G1 (N=17)	17	14
G2 (N=51)	51	42

Table 2. Comparison of the clinical signs of dysphagia, initial and final

	G1 (N=17)		G2 (N=51)	
	Initial	Final	Initial	Final
Wet voice	6	0	12	0
Multiple swallowing	14	7	24	10
Cough	12	0	34	1
Chocking	8	0	8	0
Noisy Cervical Auscultation	10	0	14	0
Total signs for dysphagia	50	7	92	11

Table 3. Analyses of the initial and final signs of Group G1

Group G1		N	Average	Sum of the categories	Z	Asymp. Sig. (2-tailed)
Total Final - Total Initial	Negative categories	16	8.50	136.00	-3.575	.000
	Positive categories	16	.00	.00		
	Relations	1				
	Total	16				

Table 4. Analyses of the initial and final signs of Group G2

Group G2		N	Average	Sum of the categories	Z	Asymp. Sig. (2-tailed)
Total Final - Total Initial	Negative categories	45	23.00	1035.00	-5.944	.000
	Positive categories	0	.00	.00		
	Relations	6				
	Total	51				

For the analyses of the initial and final standard, it was performed Wilcoxon statistic test, according to Tables 3 and 4 that considered the presence of clinical signs of penetration/aspiration as negative categories for the analyses; they were: wet voice, multiple swallowing; cough; choking and noisy cervical auscultation. When these signs were absent, these categories were considered positive.

For G2 group there was statistically significant improvement. For G1, the relation was insignificant, despite the intense change in ASHA NOMS scale, however, in this group there was a reduced number of individuals due to the profile severity.

DISCUSSION

Dysphagia is a generalized condition and potentially fatal that can arise from a variety of disorders that affect the neural, motor and/or sensorial system parts that base the swallowing function[1].

Literature describes higher incidence of dysphagia at the elderly population, resulting from muscle atrophy, cognitive decline and increase of risk aspiration. In the studied group, the average age was 57.1, very close to the populations internationally described, which is 62 years old[24].

Dysphagia patients are known for presenting lower frequency of saliva swallowing than other non-dysphagia patients[25]. The disuse of swallowing mechanism can reduce its cortical representation and corresponds to a threat to functional recovery at long term[26].

Studies[1,8] already describe that exercises in specific muscle groups, which view at swallowing, can have a significant contribution for the function rehabilitation. The significant reduction of clinic signs presence after performing the exercises reflects the functional improvement at feeding. This approach can potentially result in life quality improvement and cost reduction at the management of some dysphagia patients at the configuration of acute and chronic care.

Through the clinic evaluation performed, it was possible to observe the cough as the most prevalent sign among the participants. When analyzed by groups as the most prevalent, we have verified in G1 – multiple swallowing, followed by cough sign; G2 – cough, followed by multiple swallowing. The found results support the literature, which indicates as main predictor for dysphagia: multiple swallowing, noisy cervical auscultation, wet voice quality, cough and asphyxia[27].

There are potential limitations in our study. It was not performed objective swallowing evaluation to document silent or subclinical aspirations, once, at the service where this research was developed, there is not easy access to this parameter. The application of this very protocol of exercises in different dysphagia etiologies and different age ranges is necessary to deepen the studies at the improvement of swallowing functionality.

Nowadays, there are more questions than answers on how to approach more effective and efficiently the dysphagia rehabilitation[1], but through the use of a group of exercises it was possible to observe consistent improvement at the swallowing performance.

CONCLUSION

The objective of this research was to verify if, by means of oropharyngeal exercises, it was possible to observe functional improvement at swallowing in individuals identified with risk of oropharyngeal dysphagia. The performance of the protocol of exercises showed to be efficient, allowing the reduction of clinical signs presented for dysphagia, and improvement at ASHA NOMS functional scale.

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Author contributions

ICFA has made contributions to the conception and design, data collection, data analyses and interpretation; CRFA has made contributions to the conception and design, data analyses and interpretation