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## RESEARCH

**Correlação do grau da disfagia orofaríngea neurogênica com grau da disфонia em idosos: análises correlatas**

Correlation between the degree of neurogenic oropharyngeal dysphagia with the level of dysphonia in the elderly: analysis related

Correlacion del grado de disfagia neurogénica orofaríngea con el grado de disфонía en los ancianos: análisis de correlacion

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### ABSTRACT

**Objective:** to analyze the correlation between the results of the evaluation of the degree neurogenic dysphagia with dysphonia. **Method:** this is a prospective clinical investigation. 45 participants aged 60 to 85 years old, 9 with Parkinson, 22 with stroke and 14 with dementia, and complaints of swallowing disorders and voice were participating. Dysphagia and dysphonia scales were applied in two stages: initial and final evaluation after therapy. Research and term of informed consent approved by the Ethics Committee of the Hospital Copa D'Or, Rio de Janeiro / RJ, CAAE No. 11241113.00005249. **Results:** it was showed a significant improvement in dysphagia in 73% of patients, whose average age was 79.4. Voice quality improved in 62% of patients, with an average age of 78.9 in a time of 11.6 sessions of speech therapy. **Conclusion:** the elderly with neurogenic dysphagia and dysphonia showed improvement in the evolution of the scales at the end of rehabilitation. **Descriptors:** swallowing, voice, elderly.

### RESUMO

**Objetivo:** analisar a correlação dos resultados da avaliação entre os graus da disfagia neurogênica e disфонia. **Método:** trata-se de pesquisa clínica prospectiva. Participaram 45 idosos entre 60 a 85 anos, 9 com Parkinson, 22 com Acidente vascular encefálico e 14 com demência, e por apresentar queixas de alteração na deglutição e voz. Aplicadas as escalas de disfagia e disфонia em dois momentos: avaliação inicial e final, após fonoterapia. Pesquisa e termo de consentimento livre e esclarecido aprovados pelo Comitê de Ética do Hospital Copa D'or, Rio de Janeiro/RJ, CAAE nº 11241113.00005249. **Resultados:** observou-se melhora da disfagia em 73% dos pacientes, com média de idade de 79,4. A qualidade vocal melhorou em 62%, com média de idade de 78,9, em 11,6 sessões. **Conclusão:** os idosos com disfagia neurogênica e disфонia apresentaram melhora na evolução das escalas ao término da intervenção fonoaudiológica. **Descritores:** deglutição, voz, idoso.

### RESUMEN

**Objetivo:** analizar la correlación de los resultados de la evaluación entre los grados de la disfagia neurogénica y de la disфонía. **Método:** es una investigación clínico prospectivo. Participaron 45 ancianos entre 60 y 85 años, 9 con el Parkinson, 22 con accidente vascular encefálico y 14 con demencia y también por presentar quejas por cambios de la voz y de la deglución. Fueron hechas escalas de disfagia y disфонia en dos ocasiones: evaluación inicial y final pos fono terapia. Investigación y consentimiento libre y aprobado por el Comité de Ética del Hospital Copa D'or, Rio de Janeiro / RJ, CAAE No. 11241113,00005249. **Resultados:** hubo una mejora de la disfagia en 73% de los pacientes, con una media de edad de 79,4. La calidad de la voz mejoró en 62%, con media de edad de 78,9, en 11,6 sesiones. **Conclusión:** los ancianos con disfagia neurogénica y disфонía presentaron mejora en la evolución de las escalas al final de la intervención de un patólogo del habla. **Descriptor:** deglución, voz, anciano.

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## INTRODUCTION

**S**ymptoms of neurogenic dysphagia are frequent in older people, because the more causative factors, such as the primary brain vascular accidents (strokes), Parkinson's disease and dementia, occur more frequently in this age group.<sup>1</sup> These neurological disorders in their clinical picture change in swallowing mechanism, as well as in voice. This occurs as a result of the dynamics of speech/articulation and swallowing that depend on several factors, such as the integrity of the nervous system, the tone, mobility and sensitivity of oropharyngeal structures.<sup>2</sup>

Although dysphagia is the most common manifestation in patients with Cerebrovascular post-stroke (CVA) and post-Trauma Skull Injury (TSI), laryngeal dysfunction, such as decreased mobility of muscles adductors and abductors, with incomplete or even slow closure of the vocal folds, may result in vocal changes as hoarseness, harshness and instability,<sup>3-4</sup> to justify the dysphagia in these patients.

During the aging process, physiological changes occur that involve modifications in oral functions, as well as in the speech/articulation process. One of the complaints reported by the elderly, the main involve changes in swallowing, difficulty in controlling and ingestion of food bolus, oral motor incoordination, loss of smell, reducing the taste buds, and even loss of dentition. In addition, changes in vocal quality can be checked in this population, as vocal fatigue, feeling the lump in throat, presence of laryngopharyngeal secretion, coughing, perception of symptoms of gastroesophageal reflux and changes in sensitivity. Therefore, it is evident the importance of understanding the relationship between swallowing and voice of the elderly.<sup>5</sup>

The scales of classification of the degree of impairment of dysphagia has been one of the instruments used within the process diagnosis of this symptom, seeking help in risk identification, classification of dysfunction, as an instrument to assist in the definition of conduits or as a parameter to control the effectiveness of rehabilitation.<sup>6-7</sup>

As for the evaluation of the voice, the scale is a perceptive assessment RASATI-vocal quality hearing and has as main objective to define features vocals that are: hoarseness, roughness, asthenia, tension and instability.<sup>8</sup>

Therefore, the objective of this research was to analyze the perceptual correlates between the results of the clinical evaluation of swallowing, with the perceptive additive evaluation of voice in the first and last speech therapies service.

## METHOD

It was conducted a prospective clinical study. This research and its informed consent term have been approved by the Research Ethics Committee of the Hospital Copa d'Or in Rio de Janeiro/RJ, under the CAAE nº 11241113.00005249. Resolution 196/96 of the National Commission of ethics in research-CONEP.

45 elderly people participated in this research with the diagnosis dysphagia neurogenic, being 17 male and 28 female, with an age range from 60 to 85 years old, with an average age of 79.8 years old, in the period from January to April 2013.

Elderly patients referred for speech therapy service in the Hospital Copa d'Or were included with neurological changes diagnosis, presenting complaints relating to stomatognathic functions, i.e. incorrect execution of respiration, mastication, swallowing, speech and voice.

Older people with clinical picture unstable or comatose, tracheostomized and with cognitive impairment that disables the elderly were excluded to participate in the research.

Research participants were assessed in a Quaternary Hospital (Hospital Copa D'or), located in Rio de Janeiro.

In the study, we used Free and Clarified Consent Term for elderly patients hospitalized, Protocol adapted from clinical evaluation of swallowing, perceptive-auditory assessment protocol, disposable gloves for procedures, netbook (Recording)-LG x140, microphone with adapter to eliminate noise - Andrea Part Number-USB-AS-1 (C1-1021450-1) and headphone- Portapro-Koos.

The sample was characterized with 9 patients with diagnosis of underlying disease, Parkinson, 22 patients with diagnosis of cerebrovascular accident (CVA) and 14 diagnosed with Dementia.

Scales were applied to classify the degree of impairment of oropharyngeal dysphagia and dysphonia level at two different times: in assessing initial and final assessment in speech therapy. All patients underwent to speech therapy daily, lasting 40 minutes per session. Therapeutic strategies employed were: sensorimotor oral motor stimulation, consistency and volume manipulation of diet, vocal techniques and swallowing manoeuvres.

Swallowing was clinically assessed considering criteria adapted from swallowing Protocol:<sup>9</sup>

- 0- Adapted swallowing (deglutition normal in all consistencies or with difficulty in oral or pharyngeal phase with compensation and residual cleaning spontaneously, without signs of tracheal aspiration and/or laryngeal penetration);
- 1-Light dysphagia (discreet suction for liquid consistencies with cough reflex); 2-moderate dysphagia (aspiration for two or more consistencies, with or without cough reflex with good compensation during postural manoeuvres); 3-severe dysphagia (presence of substantial aspiration and absence or failure in swallowing. Without diet oral conditions, even under the guidance of strategies of the audiologist).



The recording of the voices of each participant were made by a Netbook-LXx140 with unidirectional microphone and adapter to eliminate noise - Andrea PureAudio 123 USB-AC, situated ten centimetres from the speaker with pickup angle of 45°.

The recording occurred with the elders sitting, ordered to issue the vowel /a/ in a prolonged and counting the numbers of 1 to 10, as natural as possible.

Later, those voices were analyzed by three phonoaudiologists, voice experts, all with auditory training, using a database that was not part of the study, through the scale RASATI. This scale allows to analyze the following aspects of vocal quality: roughness of voice (R), harshness (H), breathiness (B), asthenia (A), voltage (V) and instability (I), which as a whole determines the general grade of dysphonia. Each of these aspects may be ranked on a scale of severity of 0 to 3, 0 being no change; 1 slightly changed; 2 moderately changed and 3 severe change.

LG Netbook x140 was used for the submission of voices to speech pathologists, who conducted the hearing assessment individually, in a quiet environment. 45 voices were presented randomly, without providing diagnostic information for evaluation, being 28 female and 17 male, stipulating the listening of up to three times each voice for an evaluation in consensus; in the case of no consensus, it was considered the answer of the majority. It was also examined by a fourth audiologist, an expert in voice, vocal quality, without the use of RASATI Protocol. This perceptual analysis was based on the professional experience of the appraiser. The data was tabulated and analyzed statistically through the Excel program, using the Pearson correlation test and T-test Paired.

## RESULTS AND DISCUSSION

Below are the clinical characteristics, language found in this sample.

Table 1- Correlation level of dysphagia in the range O'Neil (improvement, maintenance and worsening on the scale) with the level of dysphonia in RASATI scale (improvement, maintenance and worsening in the range).

	Improved the level of Dysphonia n (%)	Maintained the level of Dysphonia n (%)	Worsened the level of Dysphonia n (%)	Total n (%)
Improved the level of Dysphonia	26 (58%)	9 (20%)		35 (78%)
Maintained the level of Dysphonia	1 (2%)	7 (16%)	1 (2%)	9 (20%)
Worsened the level of Dysphonia		1 (2%)		1 (2%)
Total	27 (60%)	17 (38%)	1 (2%)	45 (100%)

Table 2-relationship between the character of the underlying disease and the effect of speech therapy on the O'Neil and RASATI scales.

Improve in Dysphagia	Disease			Total n (%)
	CVA n (%)	Dementia n (%)	Parkinson n (%)	
No	4(9%)	4(9%)	4(9%)	12(27%)
Yes	17(38%)	11(24%)	5(11%)	33(73%)
Total	21(47%)	15(33%)	9(20%)	45(100%)

  

Improve in Dysphonia	Disease			Total n (%)
	AVE n (%)	Dementia n (%)	Parkinson n (%)	
No	5(11%)	7(16%)	5(11%)	17(38%)
Yes	16(36%)	8(18%)	4(9%)	28(62%)
Total	21(47%)	15(33%)	9(20%)	45(100%)

Table 3-speech pattern according to the use of dental prosthesis

Articulatory Precision		Dental prosthesis							
		Present				Absent			
		initial		Final		initial		Final	
		n	%	N	%	N	%	N	%
Vowel	Adequate	7	16%	17	38%	3	7%	18	40%
	Changed	14	31%	4	9%	21	47%	6	13%
Count	Adequate	7	16%	17	38%	2	4%	18	40%
	Changed	14	31%	4	9%	22	49%	6	13%

Table 4-It shows the analysis of vocal quality in the parameters: tremor, magnitude and articulation, speech at the time of initial evaluation.

Parameters		Initial Evaluation											
		Sustained Vowel						Count					
		Men		Women		Total		Men		Women		Total	
		n	%	N	%	n	%	N	%	N	%	N	%
Tremor	Present	15	33%	20	44%	35	78%	14	31%	20	44%	34	76%
	Absent	3	7%	7	16%	10	22%	4	9%	7	16%	11	24%
Amplitude	Reduced	15	33%	22	49%	37	82%	15	33%	22	49%	37	82%
	Adequate	1	2%			1	2%	1	2%			1	2%
	Increased	2	4%	5	11%	7	16%	2	4%	5	11%	7	16%
Articulation	Adequate	5	11%	5	11%	10	22%	5	11%	4	9%	9	20%
	Changed	13	29%	22	49%	35	78%	13	29%	23	51%	36	80%

Table 5-Shows the analysis of vocal quality in the parameters: tremor, magnitude and articulation, speech at the time of the final assessment.

Parameters		Final Evaluation											
		Sustained Vowel						Count					
		Men		Women		Total		Men		Women		Total	
		n	%	N	%	n	%	n	%	N	%	n	%
Tremor	Present	4	9%	15	33%	19	42%	4	9%	14	31%	18	40%
	Absent	14	31%	12	27%	26	58%	14	31%	13	29%	27	60%
Amplitude	Reduced			4	9%	4	9%			4	9%	4	9%
	Adequate	17	38%	20	44%	37	82%	17	38%	21	47%	38	84%
	Increased	1	2%	2	4%	3	7%	1	2%	2	4%	3	7%
Articulation	Adequate	14	31%	21	47%	35	78%	14	31%	21	47%	35	78%
	Changed	4	9%	6	13%	10	22%	4	9%	6	13%	10	22%

Dysphagia is characterized by a set of signs and symptoms in swallowing, and may arise from changes in the stomatognathic system. The most frequent oropharyngeal dysphagia are the mechanics and neurogenic, these are our object of study. Voice changes and speech/articulation were evaluated in individuals who have neurogenic dysphagia. For this study, we used the scales O'Neil<sup>9</sup> and RASATI<sup>8</sup>, confronting data obtained from initial and final language assessments. Vocal records were held in these two evaluative moments, and were essential to the implementation of evaluations of auditory, post-speech therapy, from 10 to 12 sessions.

In table 1, it has been found that 58% (N = 26) showed so much improvement of dysphagia and dysphonia, significantly relevant result. Studies reinforce the need for integrated approach of mechanisms of breathing, swallowing and phonation in speech therapy practice and show better understanding of this relationship and its effects on dysphagia.<sup>2-3,8,10</sup>

The relationship between the character of the underlying disease and the effect of speech therapy on the scales O'Neil and RASATI is in the table 2. The basic diseases reported are the AVE (47%), dementia (33%) and Parkinson's (20%). Of the total of 47% of patients with CVA, 38% showed improvement in dysphagia and 36% on dysphonia. As for the result of dementia (33%), 24% improved dysphagia and 18% dysphonia. In relation to Parkinson's disease (20%), 11% obtained improvement in dysphagia and 9% on dysphonia. The speech therapy effect reveals positive developments of the dysphagia and dysphonic, although the results of the quality of voice have been slightly smaller. These observed differences in the three diseases are described in the literature, noting here the findings concerning the swallowing and voice. In recent studies, it was observed that the neurological disorders are common in the elderly, and causing more severe repercussion in the dynamics of swallowing, combined with other signs, lead speech/articulation changes characterized by: decreased intensity of the voice, imprecise articulation and speech speed changes, with more evidence on elderly with Parkinson's.<sup>11-12</sup>

The speech pattern (vowel and count emission) according to the use of dental prosthesis (Table 3) was evaluated in patients with prosthesis (N = 21) and without prosthesis (N = 24). In the initial assessment, of 21 patients with dental prosthesis, 16% (N = 7) presented an adequacy in vowel emission and 31% (N = 14) not; on count emission, the same indexes were found. In the final evaluation, post-speech therapy, there was a significant improvement on articulatory precision with regard to two parameters, ranging from 16% (q: N = 7) to 38% (q: N = 17), revealing, in this way, the positive results with

speech therapy intervention in the processes of oral motor function, with the purpose of restoring chewing, sucking, swallowing and speech.<sup>13</sup>

Patients without dental prosthesis (N=24) also showed improvement in articulatory precision in two parameters investigated (Table 3). When comparing the initial assessment with the end of sustained vowel there was a growth of 7% (N = 3) to 40% (N = 18) in the group with appropriate emission, which was also observed in the pattern changed. In this, the improvement from the decline of 47% (N = 21) to 13% (q: N = 6). Regarding the count, similar results were observed, ranging from 4% (N = 2) to 40% (q: N = 18) in the group of proper articulation and 49% (N = 22) to 13% (N = 6) in the articulation changed. Once again, it is proved to be a positive in the results obtained by the speech act specializing in voice and dysphagia. The research highlight that speech therapy is in constant evolution, demonstrating its clinical and scientific maturity. It is appropriate, therefore, that the ability to select the appropriate therapeutic planning is directly linked to the ability to conduct a thorough and complete evaluation.<sup>14-15-16</sup>

In addition to the scale RASATI, auditory analysis of vowel quality in tremor parameters and amplitude, and an evaluation of the articulation, being evaluated at the beginning (table 4) and at the end of the therapeutic process (Table 5). In these tables, the patients were grouped into two groups: one for men and another for women.

In the initial assessment (Table 4) of sustained vowel, the tremor is present in 33% (N = 15) of men and 44% (N = 20) women, and absent in 7% (N = 3) of men and 16% (N = 7) of women. This difference is found in published studies that link the physiological changes that occur in the larynx with increasing age and postmenopausal complications, interfering in the parameters of quality of voice.<sup>17</sup> Regarding the count, there was also a greater lag in women. The tremor in men occurred in 31% (N = 14) and women in 44% (N = 20), being absent in 9% (N = 4) and in 16% (N = 7), respectively.

In the initial assessment (Table 4) of sustained vowel, the amplitude is reduced by 33% (N = 15) in men and 49% (N = 22) in women, and appropriate in 2% (N = 1) in men; There is no adjustment in women. It is also added an amplitude increased by 4% (N = 2) in men and in 11% (N = 5) in women. Similar data were found in the related literature, for example, intensification of ossification of the laryngeal cartilage, which are more rigid and less distensible structures, causing significant changes in the structure of vocal folds on woman.<sup>18-19</sup>

In the initial assessment (Table 4), of count, the magnitude presented data equal to those of the vowels in the groups of men and women, differentiating itself, however, as for the data of the tremor. Thus, the tremor is present in 31% (N = 14) in men and in 44% (N = 20) in women, being absent in 9% (N = 4) in men and in 16% (N = 7) in women. These data, in a way, reflect the diseases studied in our research, because it comes to a sign seen often, and especially in parkinsonian. It can be said that the vocal tremor, related neurological pathologies such as the aging process, consists of rhythmic and involuntary oscillation of voice.<sup>8, 13.20-21-22-23</sup>

In the evaluation of articulation (Table 4), women were more adversely affected indexes compared to men, as noted in the count. In sustained vowel, the articulation is adequate in 11% (N = 5) in men and women, however, changed in 29% (N = 13) in men and 49% (N = 22) in women. In the count, the articulation is adequate in 11% (N = 5) in men and



9% (N = 4) in women, however, changed in 29% (N = 13) and 51% (N = 23), respectively. Such findings are reported in the studies published, paying attention to perception of a locked articulation that may cause distortions of sounds and lack of accuracy in the Constitution, in addition to causing the prints of unwillingness to communicate, containment of feelings and aggressiveness.<sup>16,24</sup>

In the final evaluation of sustained vowel (Tabela5), the tremor is present in 9% (N = 4) in men and in 33% (N = 15) in women, and absent in 31% (N = 14) in men and in 27% (q: N = 12). In this way, there is improvement in men and women; but even with significant lag in the women's group. As the count, the tremor in men is present in 9% (N = 4) and 31% (N = 14) in women, and absent in 9% (N = 4) in men and in 31% (N = 14) in women. Again, it is realized that, in the parameter relative to the tremor, the women showed greater commitment. Such results suggest that the older the woman minor frequency variation capacity, especially for the most acute of vocal range. This, to some extent, agrees with the literature, in which structural changes arising from the degenerative aging and/or neurological processes, in particular, cause laryngeal modifications lower elasticity and strength of the vocal folds.<sup>14, 22.25-26-27-28</sup>

In the final evaluation of sustained vowel (table 5), the amplitude is reduced by 9% (N = 4) in women, adequate in 38% (N = 17) in men and in 44% (N = 20) in women, and increased by 2% (N = 1) in men and in 4% (N = 2) in women; If not found in the reduction group of men. In the final evaluation of the count (table 5), the range presented data equal to those of the vowels in the groups of men and women, differentiating itself, however, as to the result of adjustment in women. When considering the voice suffers effects of aging and/or changes resulting from neurological, and vocal exercises benefit the vocal production and speech articulation dynamics, there are, in the present study, similar results and favorable post-speech therapy.<sup>19.28-29-30</sup>

In the final evaluation, the articulation count reveals similar responses to the vowel in both genres, matching appropriate in 31% (N = 14) in men and in 47% (N = 21) in women, and altered in 9% (N = 4) in men and in 13% (N = 6) in women, and most women showed significant improvement in articulation. There are also in this research, because it achieved positive indices, reinforce the importance of myofunctional exercises to increase strength and amplitude of movements of stomatognathic structures.<sup>1,12-13,21,25,29,31</sup>

## CONCLUSION

The data obtained from the research made it possible to conclude that:

1. With the speech intervention improved:
  - 1.1. Oropharyngeal dysphagia neurogenic;
  - 1.2. the dysphonia;
  - 1.3. the speech pattern.
2. The gravity influenced the results, considering that:



2.1. 73% of the elderly showed improvement of dysphagia, using a shorter time of attendance, with an average age of 79.4;

2.2. The vocal quality improved in 62% of the elderly, with an average age of 78.9, at a time of 11.6 speech therapy care sessions.

3. The voice exercises were effective in rehabilitation of neurogenic dysphagia, because the relative parameter:

3.1. The tremor was mitigated. The 33% (N = 15) of the elderly, who presented the symptom, improved after speech therapy; only 9% (N = 4) continued to present the tremor. Of 44% (N = 20) of the elderly, which in initial assessment showed the symptom, 27% (N = 12) showed significant improvement, according to which the more elderly women, reduced their ability to frequency variation, especially for the most acute of vocal range, as found in the literature.

3.2. The breadth has improved in elderly 38% (N = 17) and in older 44% (N = 20).

3.3. The articulation obtained favorable outcome in 31% (N = 14) of the elderly men and 47% (N = 21) of the elderly women.

Considering that aging alters the physiology of swallowing function, voice and speech, and neurological diseases are frequent in the elderly, a better understanding and comprehension of these changes come to corroborate the improvement of prevention, diagnosis, treatment and quality of life of seniors.

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