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Case Report

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Motor speech treatment in flaccid dysarthria: a case report

Tratamento motor da fala na disartria flácida: um estudo de caso

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ABSTRACT

This study described the motor speech bases assessment and therapeutic process conducted through the hierarchy of motor speech treatment in a 45-year-old person, male, that has flaccid dysarthria caused by stroke. This patient received speech-language therapy after three years since the brain lesion, during 25 weekly sessions that occurred in 8 months. Speech-language assessments were applied before and after therapy, as well as a specific evaluation after each base motor treatment. Therapy obeyed the hierarchy of motor speech treatment, initiating with respiratory and resonance rehabilitation, following by prosodic therapy, phonatory treatment and, lately, articulatory treatment. The patient showed improvements in all motor speech bases, acquiring adequacy in respiratory support and resonance during the speech, improvements in prosody, more articulatory precision, and vocal stability. Beyond that, about patient self-perception about therapeutic progressions, he related reduction of the dysarthria impacts in his life quality. In this way, the benefits of speech-language therapy in dysarthria had been evidenced, mainly at following the proposal of the hierarchy of motor speech treatment structure. Results allowed us to conclude that an appropriate therapeutic approach may offer benefits even years after cerebral lesion.

Keywords: Dysarthria; Articulation disorders; Neuromuscular diseases; Speech therapy; Adults

RESUMO

Este estudo descreveu o processo de avaliação das bases motoras e de intervenção, conduzido através da hierarquia do tratamento motor da fala em uma pessoa do sexo masculino, de 45 anos, que possui disartria flácida decorrente de acidente vascular encefálico. O paciente recebeu tratamento fonoaudiológico após três anos da lesão cerebral, dividido em 25 sessões semanais, que ocorreram durante oito meses. Foram realizadas avaliações fonoaudiológicas pré e pós terapia, bem como após cada período de tratamento de uma base motora. A terapia obedeceu à hierarquia do tratamento motor da fala, iniciando pela reabilitação da respiração, ressonância e prosódia, seguindo para terapia da fonação e, por último, ajustes da articulação. O paciente apresentou aperfeiçoamento em todas as bases motoras, adquirindo adequado suporte respiratório e ressonância durante a fala, melhorias na prosódia e precisão articulatória e mais estabilidade vocal. Além disso, quanto à autopercepção do paciente, em relação aos progressos terapêuticos, este relatou diminuição dos impactos da disartria na sua qualidade de vida. Sendo assim, foram evidenciados os benefícios do tratamento fonoaudiológico na disartria, principalmente ao seguir a estrutura proposta pela hierarquia do tratamento motor da fala. Os resultados permitiram concluir que uma adequada abordagem terapêutica pode proporcionar ganhos, mesmo alguns anos após a lesão cerebral.

Palavras-chave: Disartria; Transtornos da articulação; Doenças neuromusculares; Fonoterapia; Adultos

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INTRODUCTION

Dysarthrias are a group of motor speech disorders caused by neurological injury and characterized by abnormalities of breathing, phonation, articulation, resonance, and or prosody due to irregularities of strength, rate, amplitude, firmness, tone or precision of the speech mechanism[1]. Decreasing in the intelligibility and speech naturalness associated with dysarthria can cause challenges in participation in daily activities, as well as changes in self-identity, social and emotional ruptures and feelings of stigmatization[2].

According to specific types of deficit or neurological disease, there are different types of dysarthria: flaccid, spastic, hypo/hyperkinetic, ataxic, mixed, and unilateral upper motor neuron[3]. Specifically, flaccid dysarthria results from damages to the lower motor neurons (cranial and spinal nerves) and spastic dysarthria from bilateral injuries to the upper motor neurons (corticobulbar/corticospinal tracts). Ataxic dysarthria results from cerebellar circuit rupture. Hypo/hyperkinetic dysarthria results from a break in the basal ganglia circuit, wherein hypokinetic dysarthrias are commonly associated with Parkinson degenerative disease, but also may emerge from vascular etiologies, and hyperkinetic dysarthrias (dyskinesias) must present hyperkinetic involuntary movements, such as cases of Chorea, which belong to Huntington's Disease, Dystonia, Tics (Gilles de la Tourette Syndrome). The strokes are undoubtedly the most common cause of unilateral upper motor neuron (UUMN) dysarthria, which often presents concomitant communicative-cognitive impairment, such as visuospatial neglect or pragmatic deficits. Finally, mixed dysarthria, that is a combination of two or more types of dysarthria (for example, mixed spastic-flaccid dysarthria in Amyotrophic Lateral Sclerosis), is also common and reflects characteristics of each relevant type of dysarthria.

Flaccid dysarthria, the object of this study, is caused by lower motor neurons lesion connected to the muscles involved in the mechanism of speech, such as the cranial nerves V (trigeminal), VII (facial), IX (glossopharyngeal), XI (accessory) and XII (hypoglossal), and the spinal nerves that support the muscles of the breath, such as the phrenic and intercostal nerves. The characteristics of speech in flaccid dysarthria vary according to the nerves and muscles affected, as well as to weakness and decreased muscle tone. Overall, the central aspect of flaccid dysarthria is: few or absent lip sealing, abnormality in lips at rest and stretching, lack of saliva control, tongue abnormality at rest - noting twitching on the back -, few or absent ability of tongue movements, reduced Maximum Phonation Times (MPTs) and low speech intelligibility[4].

By understanding the physiological agent behind the altered characteristics of speech, such as weakness, slowness or incoordination, the assessment of dysarthria assists the elaboration of differential diagnosis and may guide the election of treatment approaches.

An embracing initial assessment of speech is composed of examination of the speech mechanism, screening of the speech subsystems, perceptual evaluation, and measure of intelligibility. The perceptual evaluation is the "gold standard" for the description, quantification, and differential diagnosis of dysarthria. Production tasks involving linked speech are more useful, such as conversation, narration, and reading, evaluating the production of the phonemes of the spoken language and incorporating prosodic contrasts, words of increasing size and complexity, and other useful resources in the text. Comprehensive forms of assessment usually involve determining the presence/severity of abnormalities in speech subsystems: breathing, phonation, articulation, resonance, and prosody such as rough voice, hypernasality, equalized stress patterns, and slow speech rate. It is the combination of these perceptual characteristics with other diagnostic symptoms leading to the diagnosis of dysarthria.

The observation of the characteristics of breathiness hypernasality and, together with the distinctive features of monopitch less, and inaccurate monoloudness joint, for example, justify a diagnosis of flaccid dysarthria. The presence of decreased atrophy, fasciculations or reflexes support this speech diagnosis and localize damage to the cranial nerves, particularly the vagus nerve. In contrast, the presence of distinctive low-velocity perceptual characteristics and strangled voice quality, coupled with the less unique features of monopitch, monoloudness, and imprecise articulation, would argue for a diagnosis of spastic dysarthria. This speech diagnosis would be supported, even more, by the presence of pathological reflexes and emotional lability and would be due to damage to the upper motor neurons bilaterally[2].

It is also expected that consider the impact of disability, activity limitations, and participation restrictions through the International Classification of Functioning, Disability, and Health (ICF)[5]. The ICF assists the differential diagnosis, description of the problem, the establishment of treatment objectives, and evaluation of results. The clinician observes the type of communicative difficulty, what is the main characteristic that affects the patient, makes a prognosis and establishes a therapeutic behavior, the changes in muscular or nerve level, or of a subsystem and the impact of the conditions of performance and participation in functional activities, and assesses the potential objectives that may have an immediate effect.

Rehabilitation strategies focus on optimizing communication through compensatory strategies as well as providing physiological support. It is part of the rehabilitation to guide the family and the team about strategies that can facilitate communication. The therapeutic management of dysarthrias should include the principles of neuromuscular treatment (NMT) in structured sessions, during which speech maximization strategies (for example, speed deceleration, exaggerated articulatory gestures) should be encouraged and reinforced[6]. Some sessions should include the practice of stimuli and specific linked speech situations, using a variety of activities and materials to avoid boredom, as well as adapting materials to meet individual needs. The principles of motor learning refer to the practice, structuring it in quantity, distribution, variability, and programming/planning.

The aim of rehabilitation should be the best possible communication of the patient, passing through gradual steps, beginning with the respiratory function, effective modification of the sound emission and adequacy of resonance, phonation, articulation, and prosody.

It is expected that, with this research work, the therapeutic management of flaccid dysarthria will be clarified, evidencing the therapeutic progress from the individual rehabilitation of each motor base. Thus, this study aimed to describe the process of motor bases assessment in dysarthric speech, as well as the main speech characteristics of the patient with dysarthria, before and after therapy, following the motor speech treatment hierarchy principles, concerning to structural and functional aspects of the patient, as well as communicative limitations and the impact of dysarthria on quality of life[6].

CLINICAL CASE PRESENTATION

This case study concerns a case of flaccid dysarthria caused by a stroke in the brainstem and right cerebral peduncle, attended by the Laboratory of Speech of the Federal University of Santa Maria (UFSM). This study was based on the data obtained during the speech therapy of "I", a 45-year-old patient, conducted from December 2017 to August 2018. UFSM Ethics Committee on Research approved this research under register nº 1,316.911, which was only performed after the patient signed the Free and Informed Consent Term.

The criteria for inclusion of the patient were: neurological evaluation confirming stroke - ICD I63 - and determining the location of the lesion; speech-language assessment, indicating motor sequelae for speech - ICD I69 and, consequently, dysarthria - ICD R47.1; do not have genetic syndromes and / or other difficulties resulting from factors other than stroke.

In December 2014, "I" suffered a stroke in the brainstem and right cerebral peduncle of atherosclerotic etiology (systemic arterial hypertension, diabetes mellitus, and dyslipidemia). The patient started treatment at the Speech Therapy Institution, in March 2016, 16 months after the injury, where it remained in the Institution for four academic semesters (totaling 12 months, since each semester was composed, on average, for three months of treatment). In December 2017, three years after the neurological event, "I" was transferred to the Laboratory of Speech, because it showed little evolution in speech therapy, requiring a change in therapeutic conduct. In previous speech-language reports, it was not observed a consensus of applied methodology, sometimes the patient's breathing was worked, sometimes prosody, employing adapted techniques of melodic therapy, among other approaches. The lack of methodological guidance and treatment hierarchy was most likely the great aggravator of the patient's painful speech-language rehabilitation.

The results of the pre-therapy evaluations and the effects of the therapeutic intervention are described in the paragraphs below and represented in Tables 1 and 2, and Figures 1, 2, and 3.

Table 1. Results of the auditory-perceptual assessment of the speech

Protocol	Domain	Pre-therapy	Post-therapy	Maximum score
AMIOFE	Appearance and posture	16	18	18
	Mobility	51	57	57
	Functions	25	28	28
	Occlusion	Normal	Normal	-
CAPE-V	Overall Severity	SE 80	MO 30	100
	Roughness	SE 90	MI 30	100
	Strain	SE 80	MI 30	100
	Pitch	Break MO 60	MI 30	100
	Loudness	Break SE 90	0	100
	Instability	SE 80	MO 40	100
	Tremor	SE 80	MO 40	100
	Basal sound	SE 85	MI 20	100
PAIF	Words	67%	90%	100%
	Sentences	40%	85%	100%
Dysarthrias Assessment Protocol	Structural Evaluation	Facial musculature with asymmetry; The musculature of the tongue with fasciculations; Other structural aspects within parameters considered normal.	Adequate facial musculature; The musculature of the tongue with fasciculations;	None
	Breathing	Upper time; Reduced MPTs; Other normal aspects.	Mixed type during speech and diaphragmatic at rest; Adequate MPTs.	None
	Phonation	Tense, hoarse, rough, tremulous, pasty and monotonous vocal quality; Glottal attack; Low vocal intensity; Instability of pitch and loudness.	Tension; Discrete monotony; Pitch breaks.	None
	Resonance	Little air leak in the Glatzel test; Mild hypernasal resonance.	No air leak in the Glatzel test.	None
	Articulation	Coarse movements, tremor, inability to perform more than two progressive series and reduction of speed during movement; Lingual movements for speech with progressive deterioration in performance or reduced rate; Active tongue resistance with weakness.	No abnormalities: performs five sets in five seconds; Lingual movements for speech with mild incoordination and reduced time; Active tongue resistance with weakness.	None
	Prosody	Inadequacy in tonic syllable marking; Little or no intonation.	Sporadic inadequacy in tonic syllable marking and sentence termination.	None
	Sensibility	Preserved	Preserved	None

Subtitle: AMIOFE = Protocol of orofacial myofunctional evaluation with scores; CAPE-V = Consensus Auditory-Perceptual Evaluation of Voice; MI = Mildy Deviant; MO = Moderately Deviant; SE = Severely Deviant; MPTs = Maximum Phonation Times; PAIF = Protocol for the Evaluation of Speech Intelligibility

Table 2. Results from self-evaluation questionnaires

Questionnaire	Domain	Pre-therapy	Post-therapy	Difference	Maximum score
ESV	Limitation	43	13	- 30	60
	Emotional	11	3	- 8	32
	Physical	6	3	- 3	28
	Total	60	19	- 41	120
IDV	Functional	40	20	- 20	40
	Physical	29	8	- 21	40
	Emotional	20	4	- 16	40
	Total	89	32	- 57	120
VcD	Speech	28	11	- 17	30
	Language/Cognition	16	16	0	30
	Fatigue	22	15	- 07	30
	Effects on emotion	26	17	- 09	30
	Effects on different people	25	11	-14	30
	Effects on different situations	28	12	- 16	30
	Impaired possibilities by communication disorders	20	9	- 11	30
	What contributes to changes in communication	26	11	- 15	30
	How communication is changed	20	9	- 21	30
	Perception of changes and the possibility to change speech	17	12	- 05	30
	Total	228	123	- 105	300

Subtitle: ESV = Voice Symptom Scale; IDV = Voice Handicap Index; VcD = Living with Dysarthria

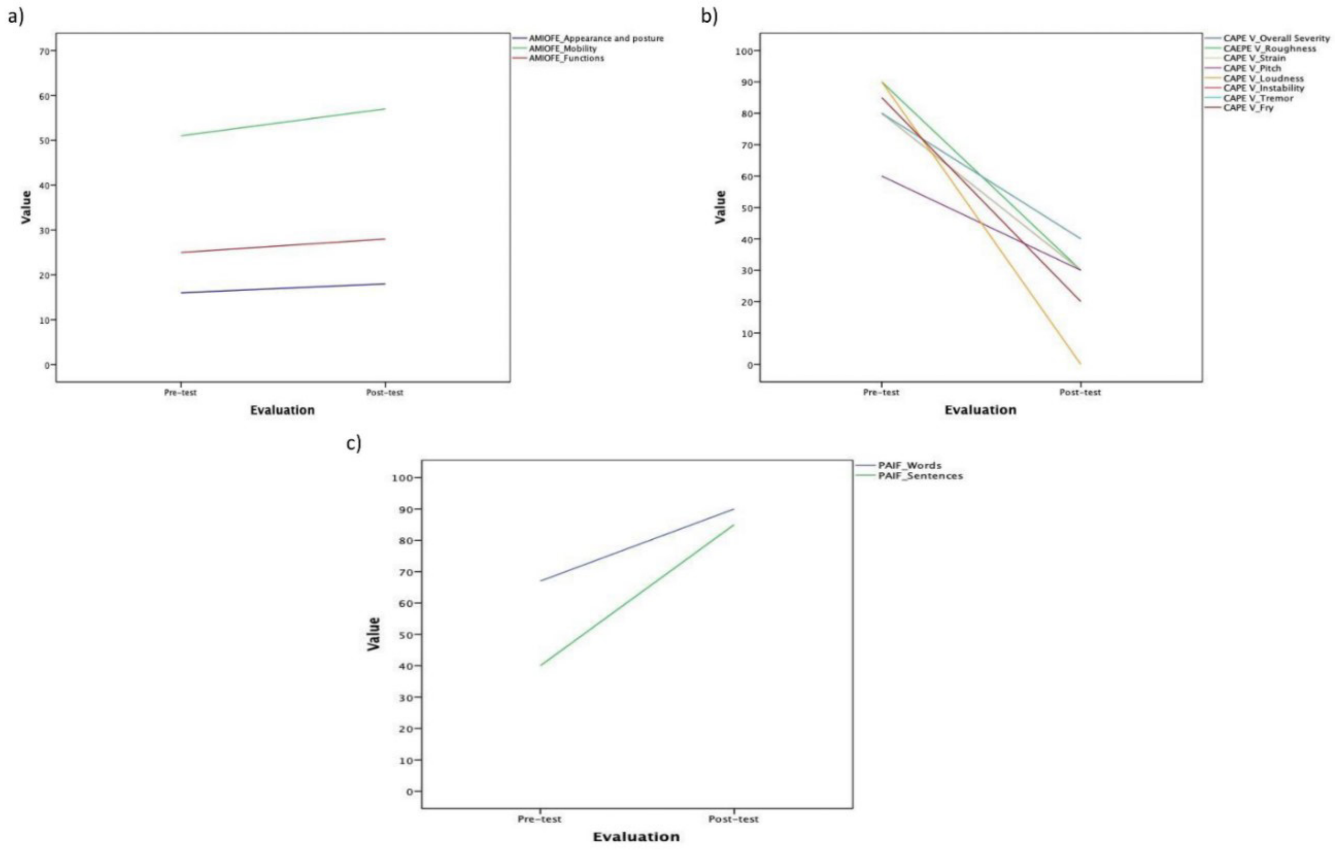

Figure 1. Comparative graph of the orofacial motricity, voice, and speech intelligibility evaluation results pre and post-therapy: (a) Protocol of Orofacial Myofunctional Evaluation with Scores (AMIOFE) in the aspects of posture, mobility and function; (b) Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) in the aspects of overall severity, roughness, strain, pitch, loudness, instability, tremor and basal sound; (c) Results of the Protocol for the Evaluation of Speech Intelligibility (PAIF) in the production of words and sentences

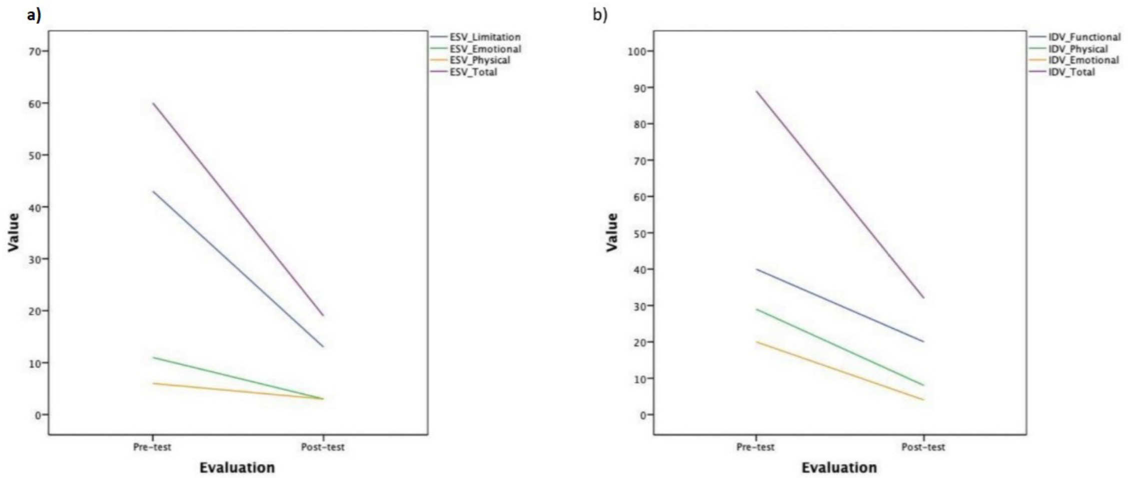

Figure 2. Comparative graph of the results of the questionnaires on vocal symptoms and voice handicap pre and post-therapy: (a) Results of Voice Symptom Scale (ESV) in the fields of limitation, emotional and physical; (b) Results of Voice Handicap Index (IDV) in the functional, physical and emotional domains

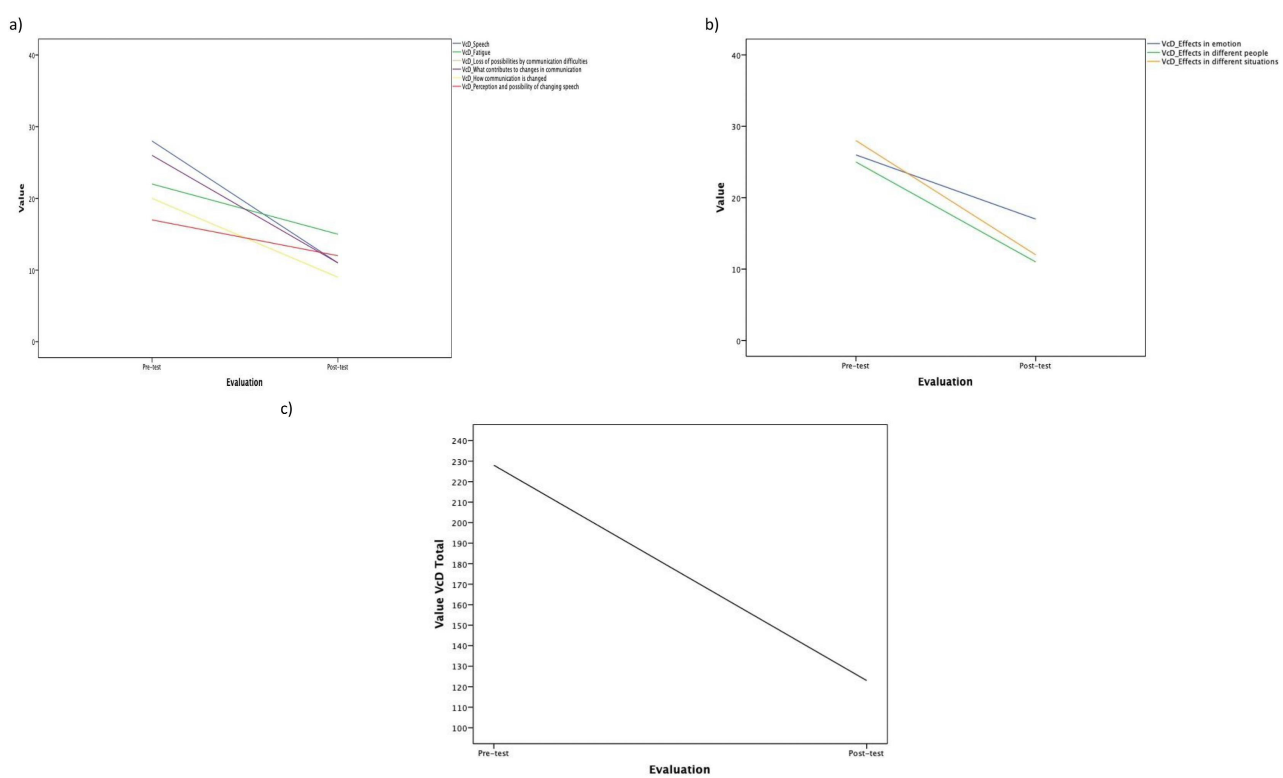

Figure 3. Comparative graph of the results of the questionnaire "Living with Dysarthria" (VCD) pre and post-therapy in the fields: (a) "speech", "impaired possibilities by communication difficulties", "what contributes to changes in communication", and "perception of change and the possibility to change the speech"; (b) "effects on emotion", "effects on different people", and "effects in different situations; (c) total score"

The model of therapy developed for this case was also written in the following paragraphs and better elucidated in the form of a flowchart (Figure 4).

In December 2017, "I" was submitted to the evaluation of the motor bases of speech: breathing, resonance, phonation, articulation, and prosody; speech intelligibility; orofacial musculature: structures, mobilities and functions; and self - perception of the patient, concerning speech and voice.

The perceptual analysis of motor bases speech was conducted using the following instruments: Dysarthrias Assessment

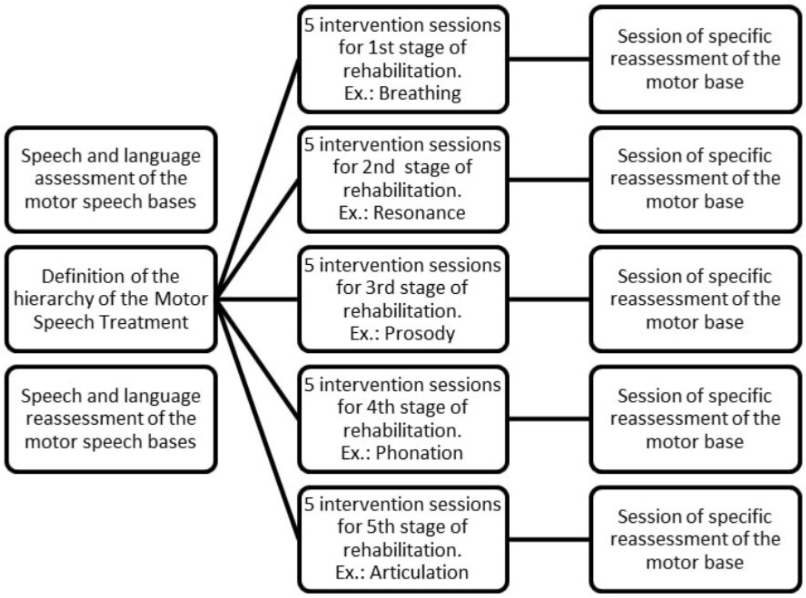

Figure 4. Flowchart of the therapy model developed according to the motor speech treatment hierarchy

Protocol[7], Consensus Auditory-Perceptual Evaluation of Voice - CAPE-V[8], Protocol Orofacial Myofunction

Evaluation with Scores - AMIOFE[9], and Protocol for the Evaluation of Speech Intelligibility - PAIF[10]. It was observed mildly reduced respiratory support for speech, moderate reduction in pitch and loudness, hoarseness, loudness decrease, moderate degree of hypernasality, moderate consonant imprecision and phoneme prolongation, slight vowel inaccuracy, moderately reduced speech rate, with little or no prosodic modulation, few speech intervals for breathing, and moderate reduction on speech intelligibility.

The perception of the patient concerning speech and voice was evaluated using the questionnaire "Living with Dysarthria" – VcD[11], Voice Symptom Scale – ESV[12] and Voice Handicap Index – IDV[13]. The answers on the VcD questionnaire indicated high impact of dysarthria in the quality of life of the patient, reaching 76% of the maximum score, with more significant problems concerning to the communication, mainly related to speech and fatigue, effects on emotion, effects on different people and situations and the perception about what contributes to the changes in communication.

In the ESV, the patient referred quite frequently to symptoms in the emotional, functional, performance, secretion, vocal sound, and vocal instability levels. In IDV, the patient was defined as extremely quiet, with a maximum handicap score, about the functional level, and quite high, to the physical and emotional level.

According to the results obtained in the first evaluation, the therapeutic objectives were defined for the rehabilitation of the five motor bases for speech, respecting the hierarchy of the speech motor treatment, i.e., the recovery of breathing, resonance, prosody, phonation, and articulation, respectively. A prosody therapy was inserted in some moments in other motor bases treatment period. At each motor base, five intervention sessions were dedicated, adding a reevaluation session of the motor base in question.

First of all, the breathing was rehabilitated with postural adjustments, with the first target being the diaphragm - costodiaphragmatic breathing - avoiding excessive use of accessory muscles to eliminate upper-type breath. The objective was to establish strength, through the sequence of fast breathing followed by slow exhalation, controlled exhalation. The therapeutic progress was measured according to the targets of treatment: diaphragmatic breathing suitability, MPTs, and adequacy of respiratory cycles. As the patient was doing physiotherapy, a multidisciplinary work with the physiotherapy team was also indicated to exercise mobility and strength. After the five sessions, inserting respiratory control into word and sentence training, with certain prosodic adjustments, the patient presented better respiratory support, adequate posture, more breath to speak, improved speech rate, reduction in loudness breaks and consequent improvement of speech intelligibility.

Afterward, the therapeutic focus was the resonance, considering the hypernasality of the patient. As the patient presented flaccid dysarthria, there were not indicated exercises of much force in the velopharyngeal musculature, in order not to accentuate the symptoms of the dysarthria. However, strategies for the adequacy of the velopharyngeal mechanism (VPM) were employed in automatic speech and reading of oral texts, such as over-articulation, reading only vowels, motor control of speech with oral plosive phonemes [pa.ta.' ka] and the use of pressure and ice. In addition to having inserted the strategies in different prosodic contexts, it was also maintained therapeutic evolution related to the patient's breathing. The measures of progression were verified utilizing the auditory-perceptual assessment of speech, in which the focus of vertical and horizontal resonance was described, as well as by the Glatzel test, in which it should have been observed a nasal escape reduction. The patient significantly reduced hypernasality and improved other aspects of speech, such as voice and articulation, although they were not the therapeutic approach.

As for the rehabilitation of prosody, it was decided to exercise this motor base thirdly, due to the significant impact that the lack of pitch modulation, loudness and intonation play in speech intelligibility. As strategies for prosodic treatment, it were performed: a pattern of emphasis on the word and sentences, with alternation between affirmative, interrogative and exclamatory sentences, as well as the variation of emotional prosody, producing sentences with different emotions, such as joy, surprise, sadness or anger. At this moment, it was also aimed to keep exercising breath every group of words to the speech rate adjustment. The patient presented very satisfactory results, although it was still necessary to insert the prosodic treatment during the rehabilitation of the other motor bases, such as phonation and articulation.

Regarding phonatory treatment, some objectives were established, such as reducing unstable, hoarse, and rough voice quality, through a more stable and precise production, and maximizing respiratory and laryngeal coordination. The techniques employed to improve glottic adduction were yawn-sigh and frequency elevation. The patient has always been advised to maintain proper posture, as well as pre-established respiratory settings and speak loud. Despite a slight progression, observed by the CAPE-V, reaching more phonatory stability, the patient reported less effort and fatigue to speak, able to produce longer sentences and speak more clearly.

Lastly, the articulatory motor base was treated seeing that a good speech intelligibility requires much more than consonants precision; it is indispensable to reset all other motor bases previously. Thus, the objectives in this final phase were: to maximize existing movements of orofacial structures and to facilitate minimal or no movements of different structures to achieve articulatory compensation points and maximization of phonemes not affected by sagging and thus maximize the degree of speech intelligibility. The strategies employed were over-articulation and exercises of the mobility of tongue and lips and articulatory training. It can be said that the patient currently has a higher speech intelligibility, verified by the PAIF, since it demonstrated increased intelligibility of 23% for words and 45% for sentences, and higher articulatory capacity, observed in the production of sequences of sounds, being able to articulate more accurately and quickly the consonants [r], [l] and [ʎ]. Some consonants, such as [s] and [z], are articulated with an anterior lisp and others, such as [t], [d] and [n], are still interdentalized. In this type of articulatory disorder, it is customary to perform exercises to improve the strength of the tongue, to avoid interdentalization; however, in cases of flaccid dysarthria, strength exercises are contraindicated.

The revaluation of the patient took place on August 2018, when the motor bases of speech were auditory and perceptually reassessed, using the same tests applied in the first evaluation. It was observed that respiratory support was adequate for speech, a discrete reduction of pitch and loudness, mild hoarseness, slight inaccuracy of alveolar consonants and prolongation of phonemes, discreetly reduced speech rate, with little prosodic modulation and slight reduction of speech intelligibility.

It was also reassessed the patient's self-perception in relation to speech and voice and, this time, the answers in VcD questionnaire indicated significant reduction in the impact of dysarthria in quality of life, reducing the score to 41%, with more significant problems concerning to communication, related mainly to language/cognition, tiredness and effects on emotion. The effects on language remained with the identical score the first evaluation, possibly because the patient currently thinks more to talk about and organize their sentences, what was not observed at the early moment of therapy.

At this point in the ESV, the patient reported less symptomatology, being more common on emotional level (shame to speak), functional (difficulty in hearing people and talking on the phone and talking in noisy places), (cough due to cigarette smoking) and vocal instability (voice change, during the day).

In IDV, the patient continued to define himself as extremely quiet, with a very high score on the functional level and few complaints regarding physical and emotional levels.

In summary, the patient presented significant therapeutic evolution about respiration, resonance, prosody, phonation, and articulation and to the perception of the therapeutic success itself. In this way, the closure of the weekly therapy was determined, with the condition that the patient would maintain a monthly frequency of treatment, to verify the maintenance of the therapeutic gains.

In Table 1, the set of tests allowed not only quantitative results on the structures, mobility, and functions of orofacial structures, vocal quality, and speech intelligibility, but also descriptions on the integrity of the functioning of the five basic motor processes, or speech motor bases, and the exact impairment of each of them (breathing, resonance, phonation, articulation and prosody).

The results were successfully achieved, as perceived by increased AMIOFE scores (Figure 1a), decreased vocal changes in CAPE-V (Figure 1b) and increased scores in PAIF (Figure 1c). In the descriptive assessment of speech motor bases, by Dysarthrias Assessment Protocol, most goals were achieved: adequacy of facial muscles, achievement of mixed respiratory type during speech and diaphragmatic at rest, adequate MPTs, reduced vocal changes, elimination of the air leak, precision of articulation, with slightly uncoordinated lingual movements and reduced time. Although the weakness, prosody has improved, persisting only sporadic inadequacy in tonic syllable marking and sentence termination.

In Table 2, the relation between the type of dysphonia, the degree of self-assessed vocal deviation and the presence of vocal symptoms (ESV) were quantified, as well as the description of the voice and the effects of the voice itself in life (IDV), and finally, the impact of dysarthria on patient's quality of life (VcD).

The results indicate that, before therapy, the patient reported many vocal symptoms (Figure 2a), mainly regarding limitation as well as an excessive vocal disadvantage (Figure 2b), reaching maximum score at the functional level and scoring more than half for obstacle the physical and emotional levels. In Figure 2, the score obtained after the therapy is impressive, because, although some symptoms and complaints remain, which were expected for the dysarthria, the patient reported a considerable improvement, almost not punctuating emotional symptoms and complaints and physics.

As for the score in VcD (Figure 3), it was observed a decrease of 105 points on the impact of dysarthria quality of life. It indicates that although there are still difficulties in communication and some unpleasant effects on life, items such as "speech," "effects in different people and different situations, "impaired possibilities by communication difficulties", "changes in communication" and "how communication is changed" have been considerably reduced.

As seen in Figure 4, the motor speech treatment goal was to achieve the improvement of the speech intelligibility through a hierarchy of treatment, in which motor bases that have a more significant impact on speech intelligibility must be regarded as first targets of treatment, and motor bases of smaller impact for speech intelligibility, lastly.

Besides considering the impact for speech, in this case, we also recognized the importance of the motor base for the integrity of the speech subsystems set. In doing so, following this hierarchy model, breathing has been first treated to make it possible subsequently resonance and phonation treatment. Because prosody affected speech intelligibility more than phonation, its treatment was anticipated. The articulatory level was lastly treated after the other motor bases had been rehabilitated since the objective in this specific case was to restore using articulatory compensation of the points and to maximize the phonemes not reached by sagging.

It is essential to highlight that the therapy sessions were divided into five stages, each stage aimed at the rehabilitation of a speech motor base, totaling 25 rehabilitation sessions and five sessions of reassessment of each motor base. The patient maintained a weekly frequency of speech therapy, with a total duration of eight months. The length of speech therapy was 50 minutes, 10 minutes dedicated to the explanation of the proposed exercise, 30 minutes of focused attention and 10 minutes of revision of the proposed training, to observe if the patient acquired the knowledge and ability to repeat some tasks at home.

DISCUSSION

The set of objective and subjective evaluations, through descriptive and quantitative tests, and self-evaluation questionnaires was very important for diagnostic conclusion, in which, especially the characteristics of reduced respiratory support for speech, decreasing and instability of pitch and loudness, vocal aspects such as tension, roughness, hoarseness, tremor, breathiness and monotony, hypernasality, consonants inaccuracy, reduced speech speed and reduction of speech intelligibility characterize a perceptive and physiological profile of flaccid dysarthria.

The effective obtainment of differential diagnostic of flaccid dysarthria contributed to the appropriate definition of motor speech treatment hierarchy and choice of motor bases treatment order. Firstly, breathing was rehabilitated to establish strength, control and respiratory support, and consequent improvement of speech intelligibility. From breathing adjustment, it was possible to go forward to the other motor bases of speech.

Speech therapy followed the principles of the hierarchy of speech motor treatment, which is a viable method of intervention for patients who exhibit clinical characteristics of dysarthric speech, like the one presented by the treated patient and, in association with motor learning, must be seen as a basis for designing the exercises and therapeutic interventions. The motor learning is defined as a set of cognitive processes associated with practice, training, and experience, which result in a permanent change of motor behaviors. Furthermore, this approach relates to principles of neural plasticity, in which are included specificity, repetition, intensity, time, salience, transference and interference, to maximize the obtainment of new neural connections[14].

The neuromotor learning model is built in association with a current state neural network, which generates muscular forces and accelerates the stimulated target, like the motor bases. The difficulties must be increased progressively in time, at each step, using the state information of previous time stage to simulate the proper physiology of motor basis, evidencing the necessity and importance of carrying out a brief specific evaluation of motor basis, from each stage of intervention (five sessions). This model also predicts a variety of patterns. For a given range, some neurons are mostly silent; other ones are more active, and another one exhibit phasic activity. With this model, it is possible to examine primary forms of motor learning.

In this way, the training objectify a force field, where the forces are trained again to implement a feedback control. This training, according to a study, can change neuronal directions, in which neurons whose adjustment properties do not change, represent memory or cinematic cells and, moreover, a structure of treatment incorporating the principles of motor learning through chaining procedures must be implemented during the therapeutic intervention in dysarthrias to assist in the acquisition of new speech skills/abilities[6].

This consideration shows itself quite impressive when it comes to a chronic case, after three years since cerebral lesion, with low progress expectations, attributed possibly to decreasing of cerebral plasticity.

The recovery of language and speech skills after a neurological event is a nonlinear process, involving different processes and patterns of recuperation, associated with the time when the neurological incident occurred. Until now, most of the studies reported that the changes in neural architecture for the language occur in early stages of recovery. However, it is known today that neuroplasticity occurs even in the chronic phase when the neurophysiological processes have already been concluded mostly. The third phase of recovery, the chronic phase, may extend from months to years after neurological lesion and, despite the major changes take place in initial stages of cerebral recovery, some mechanisms facilitate neuroplasticity and are adaptable to experience[15].

The speech skills acquired using the implementation of this treatment structure, considering the favoring mechanisms to neuroplasticity, were observed in orofacial musculature parameters. These parameters were observed through the acquisition of facial symmetry and better mobility of phonoarticulatory organs. It was also observed, in breathing, the adjustment of respiratory type to costodiaphragmatic, with reduction of accessory muscles, respiratory cycles and of MPTs adequation. In resonance, it was verified a nasality adequation and reduction of nasal air leak in oral phonemes. In prosodic level, progresses in emphasis pattern, speech speed, and modulation of pitch and loudness were observed. In phonation, the patient reached more phonatory stability and reported less effort and fatigue to speak, producing longer sentences and speaking more clearly. Finally, in articulation, his speech became more accurate and faster, with higher articulatory capacity and greater intelligibility.

Therefore, these results were promising, evidence that the treatment was quite valid in this case. Nevertheless, since it is a unique study case, the therapeutic effectiveness requires to be demonstrated with a more structured methodological design. As the results are not sufficient to determine the therapeutic efficiency, they must be interpreted with prudence. Because of that, it is suggested to test this therapeutic structure in other cases of dysarthrias, to amplify the discussion about this type of intervention.

CONCLUSION

The objective of this report was reached. The evaluation and intervention conducts were described, as well the main speech and language characteristics of a patient with flaccid dysarthria, before and after the therapeutic intervention, following the principles of the hierarchy of speech motor treatment. Regarding structural and functional aspects of the patient, as well his communicative limitations and impact of dysarthria in life quality, the benefits of the treatment for speech were evidenced.

It is essential to discuss therapy on dysarthrias to avoid that patients get little or no speech orientation, as well as a bad prognosis for dysarthric patients. The prognostics depend of, among other aspects, the initial severity of the neurological lesion, the type of dysarthria, the association with other diagnostics and, therefore, there are cases which may achieve a lot of progress, if there be an adequate speech intervention.

There is also a difficulty related to the speech-language therapist to understand its role in the rehabilitation of these patients, due to lack of knowledge of the updated principles of evaluation and rehabilitation.

The purpose of a speech therapy based on motor speech treatment hierarchy is substantiated in a physiological approach, an attempt to understand what is subjacent to alteration of the communication functionality of a person with dysarthria and, based on the obtained results, this intervention may provide very noticeable gains.

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