Dysprosody Nonassociated with Neurological Diseases—A Case Report

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Summary: Dysprosody also known as pseudo-foreign dialect, is the rarest neurological speech disorder. It is characterized by alterations in intensity, in the timing of utterance segments, and in rhythm, cadency, and intonation of words. The terms refers to changes as to duration, fundamental frequency, and intensity of tonic and atonic syllables of the sentences spoken, which deprive an individual’s particular speech of its characteristics. The cause of this disease is usually associated with neurological pathologies such as brain vascular accidents, cranioencephalic traumatisms, and brain tumors. The authors report a case of dysprosody attended to at the Núcleo de Otorrinolaringologia e Cirurgia de Cabeça e Pescoço de São Paulo (NOSP). It is about a female patient with bilateral III degree Reinke’s edema and normal neurological examinations that started presenting characteristics of the German dialect following a larynx microsurgery.

Key Words: Dysprosody—Prosody—Reinke’s Edema.

INTRODUCTION

According to its meaning, the term prosody defines the correct pronunciation of words based on the tonic accent.

Most languages have a distinctive system of accentuation for words and phrases; that is, they have a characteristic intonation or melody. The melody of speech is determined according to the geographic localization of the speaker. In some languages, eg, Chinese, tone alterations lead to semantic alterations.1 Horestein believes that prosodic elements identify and enrich the speaker’s expression.2 Nevertheless, many doubts still remain as to the forms of both speech and prosody constitution.

In prosody, there are variations of intensity, timing of phrase or utterance segments, cadency, rhythm, and intonation. All of these aspects can modify the melodic characteristics of speech and constitute suprasegmentary elements that endow words with emphasis, intonation, and inflection.3

These prosodic characteristics are indispensable to the transmission of emotion and meaning of speech, and they are considered suprasegmentary because they are beyond the word. This is thus the main aspect that leads to the recognition of a person’s culture, nationality, place of birth, and emotional conditions. It concerns the speaker’s individual expression or identity.4

Dysprosody, a very unusual neurological speech disorder, is an alteration of language characterized...
by changes in speech articulation and prosody. In the occurrence of dysprosody, syntactic constructions, cognitive aspects, and discourse vocabulary remain intact, but melody and articulation are peculiarly altered. Changes in the word’s pitch and tonicity alter the meaning, although they do not change the utterance’s syntax and vocabulary.\textsuperscript{5}

The etiology of dysprosody is associated with neurological pathologies such as brain vascular accidents, cranio-encephalic traumatisms, brain tumors, and motor manifestations such as dysarthria, apraxia, and aphasia.\textsuperscript{6}

In 1907, Pierre Marie describes the first case of dysprosody ever reported in literature. It regards a Frenchman who started presenting an Alsatian dialect after a brain vascular accident. A number of authors report dysprosody associated with neurological diseases.

In 1990, the Mayo Clinic reviews literature on 25 cases of dysprosody from 1907 to 1978, 64% in female and 36% in male patients. Out of the 25 cases, 56% developed dysprosody after brain vascular accident and 24% after trauma; in 20%, neurological causes were either negative or mistaken. Yet, 68% of the cases presented one or more neurological speech alterations such as dysarthria, apraxia, and aphasia.\textsuperscript{6}

Disorders involving linguistic components such as phonology, syntax, and lexical-semantic are associated in the literature with left hemisphere lesions. Language, though, requires other aspects to be understood.\textsuperscript{7}

Benson considers four important divisions in the realm of language: syntactic (relational), semantic (conceptual), prosodic (vocal), and gestural (motoric). Semantics and syntaxes belong to the linguistic order, whereas prosodics and gestures belong to the extralinguistic language category. The right hemisphere seems to be essential in the production of extralinguistic aspects.\textsuperscript{8}

Among the components of language, syntax particularly appears to be the most neatly lateralized, being almost exclusively an activity carried out by the left hemisphere.\textsuperscript{9,10} Recent researchers pointed out the contribution of the right hemisphere to prosody, pragmatics, and emotional aspects of communication.\textsuperscript{11}

Myers stated that lesions in the right hemisphere cause greater damage to extralinguistic factors. He also considered different extralinguistic deficits: affective-prosodic disturbances and pragmatic disorders. Affective-prosodic disturbances refer to emotional (affective) comprehension and expression, transmitted through prosodic characteristics of the oral speech (intonation profile, volume, quality, and rhythm).\textsuperscript{11}

Tucker et al\textsuperscript{12} and Ross et al\textsuperscript{13} indicated in their research that lesions in the right hemisphere lead to a disturbance in the affective component of prosody, manifested in expressionless and monotonous speech. Ross qualifies this picture as aprosody, related to lesions in the left frontal posterior inferior area, or Broca area, in the left hemisphere.\textsuperscript{14}

Patients with a lesion in the left hemisphere do communicate better than they talk, whereas patients with lesions in the right hemisphere do talk better than they communicate.\textsuperscript{15} This led to the hypothesis that the right hemisphere might be responsible for both organization and integration of different talk elements, whereas the left hemisphere would be responsible for literal language.\textsuperscript{16}

A number of uncertainties involve the forms of constitution of the mechanical act of speech and, therefore, of prosody. It is important to highlight the basis of this function, despite its complexity and questions still to be settled up. Speech starts out with the choice and definition of what is to be said. It is usually assumed that articulatory symbols are originated in the Broca area, where an electric discharge near the premotor cortex follows the definition of the speech content.\textsuperscript{17}

The stimulus proceeds on to the motor cortex, from where electric stimuli depart toward premotor interneurons, which travel through corticospinal tracts reaching the nucleus ambiguus, which activates the muscles responsible for speech by means of motoneurons.\textsuperscript{17}

In the central nervous system, there are speech modulation sites. Originating from the cortex, the stimulus travels, via corpus callosum, both to the spinal cord (corticospinal tract) and to the thalamus (corticothalamic tract). Through this path, the stimulus reaches the limbic system region, where speech characteristics, such as velocity, intonation, emphasis, among others, are assumed to be defined.\textsuperscript{17}
The next step in this path would be the region of the periaqueductal gray substance, located at the basis of the IV ventricle. At this place, stimuli would be distributed between two initial regions of premotoric interneurons, namely, the nucleus retro-ambiguus and the parvocellular formation. Each of them is connected to muscles responsible for speech.17

As mentioned, some researchers believe there are both a motoric and an emotional speech nervous system. The emotional nervous system (corticothalamic and thalamic-spinal paths) would control vowels, whereas the spinalthalamic path would control consonants. Speech has also a cerebellar control; however, the paths through which the cerebellum exerts this control are not yet perfectly elucidated.17

According to Günzburger,18 Broca established a relation connecting linguistic occurrences with the left hemisphere. The role of the right hemisphere regarding linguistic aspects remained unclear for a long period, but some authors agree as to its effective function in language processing, particularly in the realm of affective prosody. Researches carried out by Shapiro and Danly19 suggest modulation alterations in patients with lesions in the anterior right brain lesions, who present restriction in pitch variation when compared with normal speakers. They assert, further, that lesions in the right hemisphere close to the central area tend to deepen the fundamental frequency and, when located in the posterior area, tend to sharpen disturbed acute frequencies.

CASE REPORT

M. A. S., aged 46, born in Bahia, Brazil, teacher and lawyer, was attended to at the Núcleo de Otorrinnolaringologia e Cirurgia de Cabeça e Pescoço de São Paulo (NOSP). For some months, she presented dysphonia associated with dyspnea under moderate efforts. A videolaryngoscopy was performed, and a bilateral III degree Reinke edema was diagnosed (Figure 1).

The patient was submitted to a larynx microsurgery associated with tracheostomy because of intubation difficulties caused by laryngeal pathology. After the surgery, she noticed a German accent in her speech. Syntactic constructions, cognitive characteristics, and discourse vocabulary were intact.

The patient’s melody and articulation, though, were particularly altered.

The postsurgical phonoaudiological evaluation discarded the possibility of aphasia, because of the integrity and coherence of her discourse. It should be noted that the disturb presented referred to form and not to content.

Postsurgical phonoaudiological evaluation assessed parameters such as respiration, phonoarticulatory organs, articulation, resonance, vocal pitch, quality, vocal stroke, and intensity.

The time of vocal emission was slightly reduced. The larynx presented limited vertical movement. In the tongue, dorsal elevation only at the left side, limitation of this movement at the right, and difficulties as to other isolated movements were observed, all compatible with a discreet postintubation edema, which results from compression of the tongue. The soft palate was characterized by discreet asymmetry and nasal air escape for essentially oral sounds. As to articulation, phonetic productions oscillating between Portuguese and German forms were observed. Resonance proved to be predominantly guttural. The usual vocal pitch was about 175 Hz, with normal vocal inflections, but variations as to syllabic duration and accentuation were detected, with vocal tessitura varying from 131 Hz to 587 Hz. An improvement of vocal quality was noticed in singing, but the singing voice still had a foreign accent. The patient presented sudden vocal strokes,
and the remaining parameters of phonoaudiological evaluation were normal.

Vocal acoustic analysis was performed on a sample of videorecorded speech, later reproduced with a Marantz cassette recorder, and was thus not very reliable as to numeric values. It provided, though, clear data on pitch contour, duration, articulation, and rhythm.

The patient did not start to communicate in another language and had not been previously exposed to the German idiom. She was familiar with and fluent in English and French, and she preserved the German accent in both of these idioms.

Presurgical acoustic evaluation revealed intonation patterns with descending intonation curves at the end of affirmative sentences, as observed through the decrease of fundamental frequency and articulatory characteristics compatible with Brazilian Portuguese. The postsurgical acoustic analysis, however, for the same stimulus, revealed, under articulatory point of view, absence of nasality for strictly nasal sounds, tendency to the production of closed instead of open vowels (example: ö is replaced by õ), fricative sounds become alveolar, and the sound / r / become glottal; intonations presented increased fundamental frequency preceding pauses or at the end of the phrase (compatible with interrogative sentences in Portuguese), and the chain of speech evidenced a regularly marked syncopated rhythm, that is, with accentuation displacement within the phrase.

Some of these characteristics are perceptually similar to the German idiom.

Because of the awareness of a relationship between dysprosody and neurological diseases, as pointed out in literature, magnetic resonance image and neurological examination were carried out; however, the results were normal (Figure 2).

One and a half year after the surgery, another videolaryngoscopy was performed showing normal vocal folds (Figure 3) and a new phonoaudiological evaluation identified some reduction in the motoric alteration and the accent was less evident, although still present. A permanent condition was thus characterized, with variations as to the intensity of symptoms manifestation.

In the course of phonotherapy, the patient reported being under psychological treatment since long, and she was conscious of her need to change her authoritarian manners.

Phonoaudiologic therapy included motor exercises for tongue and soft palate, which came quickly back to normality, emission of sound fricatives, lips and tongue vibration, articulatory and respiratory exercises, reading with different speeds, psalmodic voice, and pitch elevation.

The patient, though, did not show up for some months, and a slight reincidence of dysprosody was then observed.

The patient reported that in the morning, relaxed, her foreign accent was actually absent, but such a condition would not last long.

In the course of the therapeutic process, it was observed that the accent would be more strongly pronounced over periods of lassitude. Respiratory exercises and relaxation of the vocal tract reduced the foreign accent.

DISCUSSION

Verbal communication is a complex issue, which involves organic, neurological, motoric, linguistic, acoustic, cognitive, and social factors responsible for
FIGURE 3. Nasofiberpharyngolaryngoscopy after one year and a half of the postoperative period shows normal vocal folds.

the determination of vocal quality and yet syntactic, semantic, and melodic aspects.

Dysprosody, or pseudo-foreign dialect, is characterized by alterations in intensity, accent, inflections, and articulation of words, which leads the listener to feel as if the patient speaks his/her native language with a foreign accent.6

The duration of each speech element and their enchainment are defined by an elaborate system of temporal control by the speaker of a given language. This control depends on neurological maturation, on anatomophysiological conditions of the phoniatric organs, and on the linguistic code. Altered velocity and rhythm endanger the effectiveness of message transmission. Pronunciation results from the phonological conditioning because of exposure to a particular linguistic code.20

The first dysprosody case ever described was reported by Pierre Marie in 1907. Most dysprosody cases are associated with neurological disorders, like brain vascular accidents, traumas, and brain tumors, besides speech disorders, like dysarthria, aphasia, and apraxia. The common elements identified in a retrospective analysis of literature on dysprosody cases carried out by the Mayo Clinic show that most cases are caused by neurological disorders. Nevertheless, this revision presents some cases where the presence of indications of neurological manifestations could not be identified.6

In the case reported, there were no signs of neurological damage or disorders to which dysprosody could be attributed.

Greene21 contrasts whispered and sonorous speech. Among speakers of the same idiom, whispered speech allows the detection of social, cultural, and educational level through the choice of vocabulary, but the origin and use of dialects can only be precisely detected according to the sonority of both vowels and diphthongs, which produces particular resonance characteristics.

This patient presented phonemic alterations oscillating from Portuguese to German, less marked disturbances when singing, and discreet variations in syllabic duration and accentuation.

Accent change (tonic syllable or word in a phrase) is marked by pitch variations, which within a context, alter the intention of the speaker and may convey different emotional charges to the same expression. These less-than-concrete characteristics involve subtle adjustments, which make it difficult for an analysis to be carried out.

Suprasegmental factors of speech, such as the duration increase of tonic syllable, decrease of fundamental frequency, and discourse breaks, provide additional information and may result in conceptual differences and opposite meanings in the same lexical material.20

In 1995, Duffy22 describes the characteristics of dysprosody. This disorder is not specific to any language. There is considerable association among particular characteristics of speech and other motoric deficiencies of both speech and language, which often come together with the pseudo-foreign dialect. Besides, it must be stressed that the mastery of the foreign idiom presented is not a condition for dysprosody to take place.4 Nevertheless, some authors do not agree with this assertion. It should be noticed that in our case, the German accent persisted even in other languages mastered by the patient: French and English.

Although no evident neurological substrate was found, we believe this is a typical case of dysprosody, considering the symptomatology observed.

CONCLUSION

Dysprosody, or pseudo-foreign dialect, is a rare linguistic manifestation, usually associated with trauma, brain vascular accidents, tumors, and damages in the right hemisphere. Only some few cases
in the world literature do not report neurological causes for this pathology. The case of dysprosody presently reported as a postsurgical consequence of larynx microsurgery is unique in the literature researched.

The physiopathology of dysprosody is uncertain, and many doubts still remain. Dysprosody does not occur in one particular language, and no previous contact with the other language is required for its manifestation.

The existence of a psychogenic component besides the functional component can be hypothesized regarding this patient. It should be noticed that the increased accent was associated with fatigue and nervousness.

The surgery performed to treat the Reinke edema may possibly have changed the patient’s vocal identification, with subsequent inability to deal with a new voice pattern; or yet some unidentified neurological disturbance caused by a temporary lack of oxygen during the surgery may have led to this prosodic condition.

GLOSSARY

- Intonation: modulation or inflection of the voice; combination of different natural tones or fundamental frequencies during speech.
- Prosody: the variation in stress, pitch, and rhythm of speech by which different shades of meaning are conveyed.
- Utterance segments: each different sound segment.
- Cadency: rhythm.
- Inflection: grammatical conjugation, variation.
- Dysprosody: disturbance of stress, pitch, and rhythm of speech.
- Cognitive aspects: aspects that include faculty of knowing, knowledge, perception, understanding.
- Articulation: form and manner in which the phonoarticulatory organs are integrated to produce each sound.
- Pitch: the quality of sound dependent principally on its frequency.
- Syntax: that part of the grammar which teaches the due arrangement of words in sentences; the correct position of words and clauses in a sentence.
- Dysarthria: defective articulation of sounds, speeches.
- Apraxia: loss of ability to carry out familiar, purposeful movements in the absence of paralysis or other motor or sensory impairment.
- Aphasia: defect or loss of the power of expression by speech, writing, or signs, or of comprehending spoken or written language, because of injury or diseases of the brain.
- Phonology: science that studies speech sounds in their linguistic aspects rather than in their resonant aspect.
- Lexical-semantics: word-meaning.
- Pragmatics aspects: studies language in its context of use.
- Aprosody: disturbance of the affective component of prosody, demonstrating a monotonous and unexpressive speech.
- Fricative sounds: a speech sound produced by forcing an air stream through a narrow opening and resulting in audible high-frequency vibrations, such as $f$ or $s$.
- Psalmodic voice: to sing psalms; chant (monotonously).
- Speech element: sound of phonemes.

REFERENCES


