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Case Report

Management of flaccid dysarthria in a case of attempted suicide by hanging

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Abstract. Present study highlights a case of 26 year old male patient who was diagnosed as flaccid dysarthria due to delayed anoxic encephalopathy by attempting suicide through hanging. Assessment and management based on speech therapy has been emancipated. This case study concluded the importance of counseling and family centered approach regarding speech therapy outcome and alternative and augmentative communication (AAC). However, patient preferred verbal mode of communication and his lack of motivation failed the use of AAC with him. A composite therapy approach including traditional approaches, prosody and naturalness, increasing respiratory support along with visual biofeedback were used, which did not turned out to be effective. This dilemma to either direct therapy for verbal mode of communication which is not effective for the case or to use AAC needs further thinking and studies with more participants to find an appropriate solution which could lead us out of this impasse to some direction. Thus the challenge for speech therapists exists.

Key words: Encephalopathy, anoxic encephalopathy, dysarthria, hyperkinetic dysarthria, flaccid dysarthria, hanging, suicidal attempt

1. Introduction

Hanging is one among several methods of suicide. Hanging is suspension of full or partial body weight using a ligature, at neck, resulting in compression of the neck that leads to unconsciousness or death by causing an increasingly hypoxic state in the brain. The neck contains several vulnerable targets for compression including the carotid arteries. Blockage of carotid arteries deprives oxygen supply whereas blocking of jugular vein prevents deoxygenated blood to exit from the brain and closing of the airway prevents respiration. Anoxic encephalopathy is a disease of the brain due to temporary or permanent lack of oxygen supply to the brain. The phenomenon of delayed progression is not understood but may be caused due to blockage or exhaustion of some enzymatic process during the period when brain metabolism is restored or even increased (1). Longer the period of unconsciousness, more likely the development of irreversible damage. A wide variety of motor disturbances may be found. Some cases have been associated with wide spread cerebral demyelization. Demyelination and abnormal metabolism in the brain may affect the areas which controls fine motor functions like speech that may cause one of the motor speech disorders-"dysarthria"

Dysarthria is lack of the ability to articulate words normally. It is a speech disorder resulting from a weakness, paralysis, or in coordination of the speech musculature that is of neurological etiology (2). The prevalence of dysarthria is 46.3% in the acquired neurogenic communication disorder (3). The ability to understand and use language is not usually affected; most people with dysarthria can read and write normally. Flaccid dysarthria may result from anoxic encephalopathy, with involvement of central nervous system diffusely similar to traumatic brain injury (4). Flaccid dysarthria is a perceptually distinguishable motor speech disorder caused by injury or malfunctioning of one or more of the cranial or spinal nerves. Treatment plan for dysarthria aims at production

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Table 1. Analysis of OPM

Articulators	At rest	At sustained position	During movement
Lips	Symmetrical but drooling present.	Lip retraction, rounding and puffing symmetrical but range of movement is restricted and strength is decreased .	Rapid repetition of lip pursing, lip retraction and cheek puffing is reduced in terms of rate and range.
Jaw	Lightly closed	Cannot resist the examiner attempt to close the jaw when told to hold it open.	Rapid opening and closing of jaw was slow.
Tongue	Symmetrical atrophic tongue, fasciculation.	Slightly deviated, cannot resist the examiner. Attempt to push the tongue back into the mouth.	Elevation and lateral movement is restricted and rate of motion was markedly slow.
Velopharynx	Symmetrical	Asymmetrical.	Asymmetrical during prolonged “ah”.

of intelligible speech with appropriate stress. The prognosis of a treatment plan is ruled by the fact that there are a number of factors that influence the outcome in the treatment of dysarthria. Prognostic factors include neurological status and history, age, automatic adjustment of the disorder, treatment, personality and intelligence, support system, sensory cognitive and language abilities, severity, motivation (5).

2. Case study

A 26 years old male was radiologically and neurologically diagnosed as delayed anoxic encephalopathy (DAE) secondary to suicidal attempt. He was referred from neurology OPD of a hospital in Kolkata. Medical examination reports revealed episodes of convulsion after an attempt to suicide, and the immediate repercussions were unconsciousness for 18 days. In severe hypoxia or anoxia, as occurs with cardiac arrest, consciousness is lost within seconds. There was gradual development of weakness and clumsiness of fingers movement and loss of hand grip followed by progressive stiffness of both lower limbs. During the course of rehabilitative management he was continuing physiotherapy and speech therapy. His pre-morbid educational and linguistic backgrounds were graduation and competency in Bengali (mother tongue), and English. Complete assessment of speech mechanism has been done. While assessing, speech mechanism during non-speech tasks showed reduced loudness and sharpness of the glottal coup. Weak cough and shortage of breath along with irregular breathing rate, rapid deterioration and recovery with rest, labored breathing, audible inspirations was observed along with absence of Gag Reflex. Other perceptual features observed were hypernasality, breathiness, diplophonia, audible nasal emissions, short phrases, pitch break, monopitch, monoloudness, reduced loudness, slow and regular AMRs, harshness, low pitch, slow rate, short rushes of speech and reduced stress, hypotonicity, atrophy, facial myokymia, fasciculations, occasional nasal regurgitation, dysphagia and drooling when leaning forward.

The Oral Peripheral Mechanism (OPM) revealed lateral face and tongue weakness, small mouth opening, and poor lip seal, weak glottal cough was observed when assessed in three conditions i.e. at rest, at sustained position, during movement, as shown in Table 1 (3).

The cranial nerve assessment suggests facial, glossopharyngeal, vagus and hypoglossal nerves involvement. Acoustic analysis of voice (Dr. Speech, version 4) shown in Table-2a, shows lowered habitual frequency and higher jitter and shimmer. It revealed mild harshness, moderate hoarseness and severe breathy voice. The client’s intelligibility was rated as 5 i.e. usually reduced under adverse conditions when content is unrestricted even when repairs are expected (3). The three qualified speech language pathologists, perceptually rated his voice as severe on Buffalo III voice profile i.e. severe impairment (Laryngeal tone-hoarse- severe, pitch-too low-severe, loudness- too loud- moderate, hypernasal-moderate, breath supply- moderate, muscles-hypotense- severe, rate- too slow- very severe, speech anxiety- very severe, speech intelligibility- very severe) (6).

Psychological evaluation showed mild cognitive impairment (compared to pre-morbid mental state). Psychological analysis of intellectual functioning showed memory affected (recent/remote) – could not finish the task in due

time. Colored Progressive Matrices (CPM) and Gessel Figure Drawing test (GFD) score was high where immediate memory functions were better.

The Boston Diagnostic Aphasia Examination (BDAE,3rd edition) was used to rule out aphasia (7). An AQ of 95% on the Western Aphasia Battery(WAB) showed no aphasic component. Photo Articulation Test revealed misarticulations in the form of consonant substitutions and omissions. The Apraxia Battery for Adults (ABA-2) was used to rule out presence of apraxia. The Frenchay Dysarthria Assessment (FDA) classified him in group 5 i.e. Lower Motor Neuron involvement (Reflex: cough-e-no cough reflex, swallow-c- eating slow, drooling-c- drools when lean forward, Respiration: at rest-b-inhalation slow, in speech-c-short breaths, Lips: at rest-b-slight droop only noticeable to skilled observer, Spread-d-spread and elevation minimal, seal-d-very poor lip seal, alternate-c-severely distorted and laboured movement, in speech- poor movement acoustically, Jaw: at rest-b-jaw occasionally drooping, in speech-c-fairly fixed position or jaw jerk apparent, Soft Palate: Fluids-a-no difficulty, Maintenance-c-inability to elevate palate for all sounds, in speech-d-moderate to gross hypernasality and noticeable nasal emissions, Laryngeal: Time-c-say "AH" for 5 to 10 sec., Pitch-c-uneven progression of 4 pitch change, volume-c- uneven progression of change in volume, in speech-c-voice deteriorates with length of passage, Tongue: At rest-d-fasciculation apparent, Protrusion-c-accompanied by facial grimace and noticeable tremors, elevation-c-moves both ways but labored and incomplete, Lateral-c-move both ways but labored and incomplete, alternate-c-tasks deteriorates with time, In Speech-c-labored speech, Intelligibility: word/repetition-d- 5 out of 10 words interpreted correctly, sentence description-d-5 out of 10 were interpreted correctly, conversation-c-speech severely distorted, can be understood half of the time and very often has to be repeated).

Primary therapeutic objective for patients with flaccid dysarthria is to achieve more efficient valving of the expiratory airflow at level of laryngeal, velopharyngeal and articulatory valves (8). The oral motor treatment approaches involved the need of motivation and rate of disease prognosis, this approach has been selected with following long term goals and short term goals. The long term goal emphasized in improving the speech intelligibility (can understand without difficulty to normal). The short term goals aimed at the maintenance of the residual strength and range of articulatory system, maintenance of the rate of speech, improvement prosody and naturalness, improvement of breathing and vital capacity, improvement of voice quality and loudness and stress.

The techniques included in therapy were used based on the efficacy and prognostic matrix over a number of session observed using TOM model (9). They were not used simultaneously in an individual session but after reviewing the prognostic indication over a number of therapy sessions for different approaches. Based on this a holistic view of management of dysarthria was posed (10, 11). The approaches used for the therapy were:

- Visual Biofeedback – to develop maintenance of jaw elevation, with subsequent reduction of drooling and improved speech intelligibility (12). To improve voice parameters such as pitch and loudness, Dr. Speech (version 4) was used to give visual biofeedback. Biofeedback treatment approach is potentially useful for the remediation of speech breathing impairment in dysarthria.
- Traditional approach - emphasized the importance of traditional methods of articulation therapy for dysarthric speakers, including
  - *integral stimulation* (watch and listen imitation tasks),
  - *phonetic placement* (hands-on assistance in attaining targets and movements, pictured illustrations of articulatory targets, and the like), and
  - *phonetic derivation* (using an intact nonspeech gesture to establish a target, such as blowing to facilitate production of */u/);* Working on *minimal contrasts* may be particularly helpful in achieving control over consonants, especially when moving from single-syllable to longer productions(13).
- Increasing respiratory support - Producing consistent sub glottal air pressure and postural adjustments were used to improve loudness and regulate breathing;
- Prosody and naturalness - Naturalness can be defined as "a perceptually derived overall description of prosody" (14). When naturalness is compromised by prosodic abnormalities, it is often perceived as monotonous or unpredictably variable. Prosodic features may be out of synchrony with syntactic structures, such as inhalation that does not occur at natural syntactic boundaries. (15).

Activities done to improve strength and range of articulatory system (3) and non speech oral motor treatment activities involved isotonic and isometric strengthening exercises which were blowing; pucker-smile; big smile; blowing kisses, protruding, lateralizing the tongue, tongue push-ups, tongue wags, tongue-to-nose-to-chin, cheek puffing, tongue curling; opening, closing and lateralizing the jaws against resistance (16).

The patterns of giving exercises were high repetition of low resistance exercises and low repetition of high resistance exercises (3). Although non speech activities may be used during the first few minutes of a session to increase attention to the face, increase awareness of movement and so on, it should be followed by working on prosody and naturalness of speech (14). The strengthening exercises were sustained maximum jaw opening, tongue protrusion and lateralization, lip retraction, pursing of lip. This was done for 15-20 minutes and leaving 20-25 minutes for more traditional speech and language therapy. The strengthening exercises were applied in 5 sets of 10 repetitions each; 3 to 5 times per session with 5-10 exercise periods per day for the patients (3). Activities done to improve the rate of speech were rate modification by hand\finger tapping. For maintaining voice quality the target was to improve loudness of the voice, breathing exercises like maximum vowel prolongation, controlled exhalation task and sighing has been administered in a very precautionary manner as this patient usually suffers from respiratory distress (3). Activities done for prosody and naturalness included working at the level of breath group. It also involved contrastive stress tasks like “Ram loves Shyam” may be produced in various expressions of mood like sad vs. happy etc. This improved naturalness and speech precision. Referential tasks included the reading of the randomized phrases and sentences containing pre specified stress targets. Activities emphasized the value of contrastive stress tasks. Speech task included maximum vowel prolongation, with duration and loudness goals. This improved client’s ability to modify pitch, loudness and duration. For voice therapy, circumlaryngeal massage was done and the carry over exercises of chewing with humming were given (17).

3. Result

After attending 20 sessions of speech and voice therapy, of 45 minute each, 5 times a week, post therapeutic results are shown in Table 2. He was also given psychotherapy thrice each week as the parents were initially not motivated although the case was highly motivated.

Table 2. Voice analysis using Dr Speech (Version 4)

Parameter	Pre therapy	Post therapy
Habitual F_0	101.61	110.88
Jitter (%)	0.31	2.31
Shimmer (%)	1.79	2.86
Fo Tremor (Hz)	1.02	1.26
Mean Fo (Hz)	98.72	104.18
SD Fo (Hz)	4.05	1.99
Max. Fo (Hz)	106.01	109.43
Min Fo (Hz)	86.47	99.77
NNE (dB)	-6.09	-5.46
HNR(dB)	29.04	30.34
SNR(dB)	27.74	28.13
Amp.tremor(Hz)	1.02	1.00
Hoarse	2	1
Harsh	1	1
Breathy	3	2

A post therapy result suggested significant changes in voice as shown in Table 2. The success of therapy after 20 sessions yielded insignificant outcomes for verbal communication; hence patient was counseled to use AAC (18). This alternative communication can range from simple alphabet board to universal gesture system, but we used word cards for nouns, pronouns, and verbs etc as his reading comprehension was good but writing was affected slightly. Patients required training or practice to become confident and comfortable with such system.

The patient preferred verbal communication and was poorly motivated for AAC. Patient failed to use AAC, and so after the 20 sessions of speech therapy and 2 sessions for AAC, the case was very frustrated and demotivated, hence the case dropped.

4. Discussion

Drop outs are not very uncommon in speech language management of communication disorder, because of variable approaches and failures to obtain desirable results (19). Insignificant therapeutic outcomes are because of lack of transfer and carryover of the techniques demonstrated in therapy. With this case as the parents were not initially motivated and the case had poor remote memory, therefore the patient could not do the maintenance and transfer of skills and techniques. In results we observed that muscle stimulation improved voice quality, as it involved less cognitive effort as compared to speech task. However, desired prognosis of speech therapy involved cognitive skills (like attention, perception, memory, retrieval etc.) and due to mild cognitive impairment the case could not compete to the desired results. Due to failure of speech therapy we evaluated for the candidacy for AAC using the criteria as given by (20, 21).

In present study after administering non speech oral motor treatment approach, we found that the patient was not improving. Muscle fibers were selectively recruited to perform specific tasks, so static non-speech tasks do not account for the precise and coordinated activity needed during speech (22). The Nonspeech oromotor exercises in dysarthria are controversial issue (23). A long-standing debate within the speech community is: whether or not training on nonspeech oral behaviors will enhance speech production (24, 25). For example, myofunctional therapy for the lingual musculature has been used under the assumption that there will be transfer of increased function to speech production (26). One report found that training involving nonspeech oral motor behaviors was helpful in a series of cases (27), although no control group was included for comparison. On the other hand, others reported that nonspeech oral movements were unrelated to residual speech in persons with dysarthria (28, 29).

Therefore to facilitate effective speech production, schema theory along with motor programming theory is suggested (30). He was not motivated to use AAC for communication. The patient continued to use gestures and insisted on focusing therapy for verbal communication. This case study throws light on one of the several challenges to the field of speech language pathologist, where the use of speech oral motor treatment approaches for the cases with DAE are controversial and the patient is not ready for alternative augmentative communication. In such situations the SLPs are in a dilemma to either direct therapy for verbal mode of communication, which is not effective for the case, or to use AAC. This issue demands vivid thinking and further studies with more participants to find an appropriate solution which can lead us out of this dilemma to some direction to give positive treatment for such patients.

5. Conclusion

The use of AAC in the management of motor speech disorders can be highly variable across and within individuals. For those, whose expected disease course is one of improvement, AAC may be relied on heavily before recovery begins and then faded as recovery takes place. Voice production device may play an increasingly important role for some speakers who are poorly intelligible but capable of some variety in speech production that retains consistency over time (31). The detailed brain imaging investigation facilitating neural substrates can be taken up for quantifying the course of stimulus and related changes in the brain. The findings of present study cannot be generalized as whole. In order to generalize the finding, similar studies can be taken up on larger sample.

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