

A Case of Head Posture Control Training Combined with Breathing Training in the Treatment of Dysarthria Brainstem Infarction Patient

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Abstract: This paper reports a case of cerebral stem infarction with quadriplegia and complete dependence on daily life. The course of the disease lasted more than 7 months. Frenchay's improved articulation Disorder Assessment Form has been assessed as severe articulation disorder. The patient has significantly improved his speech function and quality of life after systematic head control training, respiratory function training, articulation motor training, and articulation training. In the course of treatment, emphasis was placed on head postural control training and respiratory function training, and emphasis was placed on the strength and coordination training of articulatory organs, and the results were remarkable. After the patient was discharged from the hospital, the follow-up of basic daily life communication was not limited.

Keywords: Brainstem infarction; Articulation disorder; Breathing training; Head posture control training

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1. Introduction

With the development of population aging, stroke has become the first cause of death and disability of adult residents in China^[1]. Dysarthria is one of the common complications after stroke. Its main manifestations include complete inability to speak, abnormal articulation, and slurred speech^[2,3]. As it seriously affects the expression ability of patients, rehabilitation treatment of dysarthria is of great importance to the improvement of patients' subsequent daily living ability and quality of life.

2. Case data

2.1. General information

The patient was a 63-year-old male. He was admitted to hospital for "poor movement of limbs with speech

disorder for more than 7 months.” History of present disease: On April 28, 2023, the patient suddenly suffered from impaired speech with impaired movement of limbs, and was sent to other hospitals for brain stem infarction shown by head MRI. At the same time, the patient developed shallow and slow breathing and was treated with tracheotomy, thrombolysis, circulation improvement, phlegm reduction, electrolyte disturbance correction, etc. After his condition improved, the patient received rehabilitation treatment in several hospitals. Now, the patient still has impaired movement of limbs with impaired speech. For further diagnosis and treatment, the patient was admitted to the hospital. Since the onset of the disease, the patient has had poor spirit, poor sleep, normal appetite, normal stool, normal urine, and no significant change in weight. She was healthy in the past and had a history of open reduction and internal fixation for femoral fracture 15 years ago. Physical examination: conscious, weak breathing, unable to sound, quadriplegia, increased muscle tone in all extremities, bilateral Pap sign (+). Auxiliary examination: Head MRI on May 7, 2023, showed cerebral stem infarction. Preliminary diagnosis: sequelae of cerebral infarction, quadriplegia, dysarthria.

2.2. Rehabilitation assessment and treatment

For patients with normal consciousness, the result of aphasia screening and Loeston cognitive ability assessment and the modified Frenchay dysarthria assessment (FDA) is as follows ^[4]:

- (1) The evaluation content is divided into 8 items, including reflexes, breathing, lip movement, jaw position, soft palate movement, laryngeal movement, tongue movement, and speech intelligibility (29 items in total).
- (2) The evaluation results are divided into five levels: A, B, C, D, and E, with A indicating no abnormality and E indicating serious functional impairment ^[5]. For the convenience of statistics, Grade A corresponds to 5 points, Grade B corresponds to 4 points, Grade C corresponds to 3 points, Grade D corresponds to 2 points, and Grade E corresponds to 1 point. The evaluation results of admission and delivery of this patient are shown in **Figure 1**.
- (3) Evaluation of maximum phonation time (MPT): The patient is asked to pronounce “ah” as long as possible after deep inhalation and record the time, requiring proper volume and even breath, which can reflect the longest pronunciation level of the patient ^[6]. The evaluation result of the patient’s admission was 0 seconds.
- (4) Maximum counting ability (MCA) assessment: Patients were asked to count “1” as many times as possible after deep inspiration, requiring uniform speech speed and symmetrical changes in tone and volume, which can reflect the coordination between vocalization and breathing ^[7]. The evaluation result of the patient’s admission was 0 seconds. Berg’s balance function score was 0, and the head maintained a neutral position for 10 minutes, accompanied by frequent involuntary nodding movements.
- (5) Problems with speech rehabilitation: Dysarthria (voicelessness), poor head postural control, quadriplegia, complete dependence on daily living.

2.3. Rehabilitation goals

Specific treatment measures include the following:

- (1) Head postural control training
Anti-resistance extension, flexion, rotation and lateral flexion of the neck under the sitting position.
Neutral head position training includes blow paper training under different rotation angles of the cervical

vertebra under a sitting position.

(2) Respiratory function training

- (a) Abdominal breathing establishment: Give appropriate resistance to the abdomen under the seated position, ask the patient to inhale deeply, make the abdomen rise as much as possible, hold the breath for 3 seconds after the end of the inhalation, and then exhale slowly as possible, the ratio of inhaling and exhaling time is 1:2, and put pressure on the abdomen at the end of the exhalation phase to promote the reduction of residual volume ^[8];
- (b) Chest breathing training: The upper limbs and head were passively moved to relax the muscles related to breathing, the thorax was restrained with a wide restraint band, and the patient was asked to inhale and resist the enlargement of the thorax through the restraint band;
- (c) Paper blowing training: Ask the patient to inhale deeply through the nose and then blow the paper through the mouth to extend the floating time of the paper as long as possible;
- (d) Breath-holding training: The longest exhalation time training.

(3) Articulation organ movement training

- (a) Lip movement: Pout, grin, lips, cheek.
- (b) Tongue movement: Tongue resistance to forward extension, resistance to swinging from side to side, resistance to up and down movement, flicking tongue movement.
- (c) After deep inspiration, make “a” sound, observe the soft palate lift up, give real-time feedback to the patient about the soft palate movement, and pay attention to correct the nasal sound during the process.

(4) Voice training: As long as possible pronounce the “a” sound, repeat the “ba, ta, la, click” sound, and count training.

(5) Articulation similar movement training and rehearsal training

Teaching patients the articulation similar movement of consonants, mainly in the form of therapist demonstration, patient observation and imitation; Ask the patient to breathe deeply and repeat the monosyllabic word, at the same time in the patient’s voice, apply appropriate pressure in the patient’s abdomen to increase the hypoglottic pressure, promote vocal cord vibration, and then gradually reduce the assistance until the removal of the retelling content from vowel, bilabial sound, gradually transition to complex pronunciation, and then transition to double syllable overlapping words, double syllable general words, polysyllabic words ^[9].

(6) Teach the patient’s family members to carry out simple articulation organ movement training, head posture control training, breathing training, and continuous rehabilitation treatment.

3. Treatment results

Discharge evaluation: FDA evaluation results are shown in **Figure 1**, MPT evaluation results are 4 seconds, MCA evaluation results are 4 seconds, and the neutral head position time is 30 minutes.

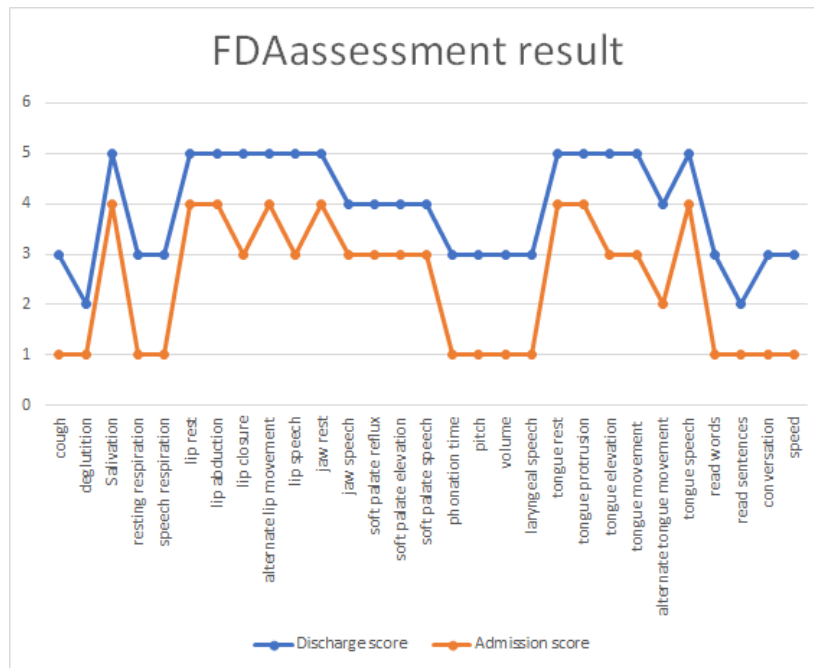


Figure 1. FDA evaluation results.

4. Discussion

After treatment, the patient's speech function was significantly improved compared with the admission, and FDA, MPT and MCA were significantly improved. In the course of the treatment of this patient, emphasis was placed on head postural control training and respiratory function training.

The respiratory system includes the lungs, diaphragm, trachea, ribs and respiratory muscles. Breathing is the dynamic basis of pronunciation and can regulate loudness, prosody, stress and the special tones in Chinese. Only with good coordination of respiratory muscles can the subglottic pressure be controlled in an appropriate range to complete the speech process and ensure the articulation of speech^[10]. In the treatment of this patient, the emphasis was placed on the training of respiratory function, emphasizing the dominant role of the diaphragm in the breathing movement, and holding the breath after inspiration to create sufficient conditions for lung ventilation and improve the patient's physical strength. The completion of a long sentence requires about 12–16 seconds of respiratory maintenance^[11]. During breathing training, attention is paid to the extension of the expiratory phase, which is an active control process that requires the participation of the expiratory muscle. After a period of training, patients can significantly increase MPT. Abdominal breathing is important, but efficient speech should be the result of complementary chest and abdominal breathing. Therefore, in the breathing training of patients with dysarthria, it is also necessary to emphasize chest breathing and relax the neck muscle group and upper limb before chest breathing to improve thoracic compliance. For patients with dysarthria, simple breathing training is far from enough, the speech must be well coordinated between the relationship between vocalization and pronunciation, so the breathing training should be carried out at the same time as the movement of the articulation organ training. The range of motion of the articulation organs of the patient has no issue, but the coordination and strength are insufficient, so the emphasis is on the strength and coordination training of the articulation organs, and the articulation similar movement training, which requires the coordination and cooperation between the articulation

organs to complete. Articulation training is a comprehensive training method that integrates the movement of respiration and articulation organs. When making the “1” sound, the vocal cords are required to be closed well and there is enough airflow to impact the vocal cords to ensure the loudness of the sound. When the vocal cords are stopped, the tension of the vocal cords is reduced. If the patient can coordinate breathing and pronunciation, the speed of “1” can be uniform ^[12]. After treatment, the MCA value of the patient increased, indicating that the coordination of voice and breath was improved.

The lesion was located in the brain stem, resulting in poor head postural control. The neutral head position was only maintained for 30 seconds on admission with involuntary nodding. Therefore, targeted head postural control training was adopted. First of all, the active and passive movements of the head in all directions were carried out, and then the patient was asked to turn the head to blow paper through the comprehensive training method. The process can be divided into head movement training, separate breathing training and air pumping training. Better head posture control and movement coordination are the basis for the completion of this movement. Patients can improve their breathing control ability through deep nasal inhalation and oral exhalation. Oral blowing is the premise of clear pronunciation of aspirated sounds ^[13]. When the head posture remains stable, the internal laryngeal muscle may be well in a state of contraction or relaxation, and the vocal cords can have the tension that should be produced when sounding. Limb muscle tension can affect the tension of the throat muscles ^[12]. It can be seen that the stability of head posture is an important guarantee of speech quality.

Studies have confirmed that the treatment of dysarthria patients must accumulate enough amount of treatment ^[14], prolong the treatment time, or increase the frequency of treatment, to show satisfactory therapeutic effect. Given this, the family members of patients are taught to carry out simple speech rehabilitation therapy and carry out continuous rehabilitation therapy after treatment. Mackenzie C *et al.* also confirmed that the continuous rehabilitation treatment of family members or companions can improve the rehabilitation effect of patients with dysarthria ^[15].

With the rapid development of modern rehabilitation technology, most patients with dysarthria can recover their daily communication ability after systematic rehabilitation treatment, and their quality of life will be greatly improved. At present, the treatment methods for dysarthria include behavioral therapy, physical therapy, traditional Chinese medicine therapy, music therapy, psychotherapy and rehabilitation education. The therapeutic effect of a single method is often limited, and a comprehensive treatment method should be adopted. In this case, head control training and breathing training are emphasized in the treatment of dysarthria. As this is merely a case report, the effectiveness of the treatment needs further study.

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Author contribution

Jingyi Li – Data collection, manuscript writing

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References

- [1] Wang K, Dong Q, Yu J, et al., 2019, Experts Consensus on Post-Stroke Cognition. *Chinese Journal of Stroke*, 16(4): 376–389.
- [2] Mitchell C, Bowen A, Tyson S, et al., 2017, Interventions for Dysarthria Due to Stroke and Other Adult-Acquired, Non-Progressive Brain Injury. *Cochrane Database Systemic Review*, 1(1): CD002088.
- [3] Chen Z, 2018, *Language Therapy*. People's Health Publishing House, Beijing, 156–157.
- [4] He W, Li S, 2010, Research Progress on Objective Evaluation of Speech Acoustic Level in Motor Articulation Disorder. *Chinese Rehabilitation Theory and Practice*, 16(2): 118–120.
- [5] Pang Z, Liu H, Gao L, 2019, Research Progress in Speech Articulation Assessment of Adults with Motor Articulation Disorder. *China Rehabilitation Theory & Practice*, 25(2): 140–145.
- [6] Speyer B, Bogaardt HC, Passos VL, et al., 2010, Maximum Phonation Time: Variability and Reliability. *Journal of Voice*, 24(3): 281–284.
- [7] Zhang Q, Liu X, Huang Z, et al., 2014, Acoustic Analysis of Periodic Continuous Fluctuation of Pitch and Loudness in Normal Adults. *Journal of Audiology and Speech Disorders*, 6: 592–596.
- [8] Fan J, Wang J, Xia C, et al., 2021, Effects of Respiratory Function Training on Motor and Respiratory Function and Activities of Daily Living in Patients with Parkinson's Disease. *Journal of Physical Medicine and Rehabilitation*, 8: 693–697.
- [9] Chang L, Wang Y, Xing J, et al., 2020, Effect of Syntactic Group Rehabilitation Training on Speech Function and Quality of Life in Patients with Poststroke Dysarthria. *Chinese Journal of Physical Medicine and Rehabilitation*, 9: 792–796.
- [10] Zheng Y, Li H, Ding S, et al., 2020, Efficacy of “Six-Character Formula” Training in the Treatment of Motor Articulation Dyslexia and Abnormal Respiratory Control After Stroke. *Chinese Journal of Physical Medicine and Rehabilitation*, 7: 618–622.
- [11] Zhang Q, Liu X, Huang Z, et al., 2014, Acoustic Analysis of Periodic Continuous Fluctuation of Pitch and Loudness in Normal Adults. *Journal of Audiology and Speech Disorders*, 6: 592–596.
- [12] Wang T, Xu L, Li F, 2020, Analysis of Lateral Articulation Characteristics in Patients with Functional Articulation Disorder and Observation of Therapeutic Effect of Phonetic Training. *Chinese Journal of Physical Medicine and Rehabilitation*, 1: 40–43.
- [13] Wang C, Tang Q, Zhu L, et al., 2018, Research Progress of Rehabilitation Therapy for Poststroke Dysarthria. *Shandong Journal of Traditional Chinese Medicine*, 37(3): 258–261.
- [14] Jiang L, Wang Q, Meng P, et al., 2014, Dysarthria Intensive Training to Improve Curative Effect Observation of Dysarthria Patients with Cerebral Apoplexy. *Chinese Journal of Physical Medicine and Rehabilitation*, 4(5): 367–370.
- [15] MacKenzie C, Kelly S, Paton G, et al., 2013, The Living with Dysarthria Group for Post-Stroke Dysarthria: The Participant Voice. *International Journal of Language & Communication Disorders*, 48(4): 402–420.

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