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Case Report

Rehabilitation of Speech and Swallowing Disorder in a Patient With Severe Brain Injury in the Subacute Phase: A Case Report

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ABSTRACT

Background and Objectives: Swallowing disorder or dysphasia is often due to neuromuscular brain damage. Dysarthria is a speech movement disorder caused by damage to the central nervous system. Dysarthria may impair the respiratory, articulation, phonation, resonance, or prosody system. This study aims to investigate the rehabilitation of speech and swallowing disorders in a patient with severe brain injury in the subacute phase.

Case Presentation: The patient was a 13-year-old child who suffered from a traumatic brain injury (TBI); the anatomical and physiological condition of the swallowing mechanism may be disturbed. Based on the evaluation by neurologists and physical examination, according to the Rancho Los Amigo Scale, he was placed at level 4 and severely impaired in cognitive speech and brain function. After being evaluated by the treatment team, he underwent rehabilitation interventions. The multiple professional team includes physicians, nurses, speech and language pathologists, and clinical dietitians. He also suffered a fracture in the left clavicle after the accident. The treatment team took about three and a half months to treat the patient in this hospital.

Conclusion: After 40 days of continuous rehabilitation, the patient's swallowing problems were resolved. The patient had acquired the ability to swallow solids and liquids naturally. Also, after 90 days, the patient could speak well, his speech being clear and with adequate breathing capacity.

Keywords: Dysphagia, Dysarthria, Severe brain injury, Subacute phase patient

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What is "already known" in this topic:

Although previous studies have reported the effect of rehabilitation on speech and swallowing disorders in patients with brain injury separately.

What this article adds:

What was distinguishable in this study is that both speech and swallowing disorders were of an acute type and showed significant changes after a period of irregular and multidisciplinary treatment.

Introduction

Regular chewing and swallowing are a complex process that involves conscious and unconscious areas of the brain, such as swallowing centers in the motor cortex and brainstem, cranial nerves, and many other nerves and muscles. This process includes the oral preparation, oral, pharyngeal, and esophageal stages. Following brain damage, two types of dysphagia can be observed, including oral dysphagia and pharyngeal dysphagia [1, 2]. Dysphagia is estimated that 37%-78% of patients in the acute stage of stroke have swallowing disorders. The frequency of swallowing disorders is higher in the initial stage of traumatic brain injury (TBI). Swallowing disorders may occur in oral, pharyngeal, and esophageal phases in TBI and stroke patients. These patients often show impaired tongue control, delayed swallowing reflex, decreased pharyngeal peristalsis, and rarely laryngeal and cricopharyngeal dysfunction [3, 4]. Swallowing disorders and behavioral/cognitive skills in patients with severe brain injury significantly affect oral food intake. People who swallow abnormally take a long time to start eating and reach complete nutrition, about three to four times longer than healthy people [5, 6]. To investigate how different populations of patients with dysphagia due to acquired brain injury respond to thermal tactile stimulation (TTS) therapy in terms of function as measured by the change in functional oral intake scale (FOIS) scores using a t-test Pairwise and Pearson correlations, Cook et al. showed that treatment of dysphagia with TTS led to statistically significant improvement in FOIS scores [7, 8].

Dysphagia treatment can be divided into three groups: Rehabilitation treatment, drug treatment, and surgical or endoscopic treatment. Facial oral therapy includes evaluation and rehabilitation management of swallowing disorders. Several research groups have suggested it for patients with impaired consciousness and after severe TBI [9]. Dysarthria is a motor speech disorder that can be classified according to the underlying neuropathology and is associated with disturbances of respiration, laryngeal function, airflow direction, and articulation, resulting in difficulties of speech quality and intelligibility [10]. Dysarthria is a common feature of central and peripheral neurological diseases, including stroke, brain trauma, neurodegenerative, and neuromuscular disorders [11]. Since the rehabilitation of swallowing disorders in patients with brain damage is vital, this article describes the severe cognitive and brain damage caused by the patient's accident. It has investigated the case of speech and swallowing disorder and its rehabilitation process in a person with brain damage. The use of different treatment methods and their effects on the quality of swallowing and speech clarity have been investigated.

Case Description

At the time of hospitalization, the patient was a 13-year-old child who suffered a brain injury in a car accident in January 2019. Based on the evaluation by neurologists and physical examination, according to the Rancho Los Amigo scale, he was placed at level 4 and severely impaired cognitive and brain function. He also suffered a fracture in the left clavicle after the accident. After the injury and transfer to the hospital, the patient underwent a hematoma surgery. After 35 days of the surgery, signs of hydrocephalus were observed in the child, in which case shunting was not performed and the patient was discharged with a respiratory infection and a coma. Due to cerebrospinal fluid (CSF) fluid accumulation, the third pair of cranial nerves is damaged and then the eye movements are restricted. Shunting is performed, after more accumulation of CSF liquid and exacerbation of hydrocephalus. In total, the patient was in a coma for 3 months and underwent shunt surgery and shunt replacement 5 times due to hydrocephalus.

About four months after the initial injury, the patient was admitted and hospitalized at Rofiedeh Rehabilitation Hospital. At the time of his visit, he was using polyethylene glycol (PEG) for feeding, while he underwent a tracheostomy for breathing. The patient's speech and language evaluation results during the visit are reported below.

Speech and swallowing assessment

The results of the cranial nerve evaluation showed that the condition of the oral, intraoral, and larynx muscles is severely weakened, which can be more precisely attributed to the weakness of the levator labia, orbicularis oris, masseter, orbicularis oculi, buccinators and the medial and lateral part of the muscle. Due to the injury to the head of the third pair of nerves, which is related to the movement of the eyelid, it is severely damaged. Therefore, the patient is injured.

The sense of taste in the anterior 2/3 of the tongue was healthy, while the posterior 1/3 part was impaired. The gag reflex was very weak. All three branches of nerve 5 (sensory and motor parts) were healthy. As mentioned, the sensory part of the facial nerve, which was related to the sense of taste in the anterior 2.3 of the tongue, was healthy. While the movement part is specific to the movement of the circular muscles around the lips, the lifter of the corners and the trumpet muscles was weak. Also, all the external tongue muscles related to the 12th pair (including genioglossi, styloglossus, and hyoglossus) were weak, and the patient could not perform tongue movements outside and inside the mouth. The results of the swallowing evaluation of this patient indicated that the patient is facing problems in different stages of swallowing; thus, he was weak in the stage of oral preparation, which includes skillfully moving the bite and requires the performance of the lips, jaw, tongue, soft palate, and muscles related to chewing and cheeks. The disorders observed in this phase include a decrease in the sensitivity of the oral area to cold and heat, a decrease in the strength and range of motion of the lips and tongue, a decrease in the ability to raise the tongue, a decrease in the lateral movements of the tongue, a decrease in the strength of the cheeks, and a decrease in the sensation inside the mouth. In the oral transition stage, he was weak due to the lack of robust and sufficient movement of the tongue to press hard on the palate. Among the common symptoms observed in the patient's oral phase disorder, he mentioned food remaining on the hard palate and tongue. Evaluations showed that this patient's pharyngeal phase of swallowing was weak due to low intraoral pressure. Symptoms of disorder in this phase include coughing during swallowing, aspiration, and penetration of substances into the airway. Also, initial assessment of shortness of breath, respiratory distress, and drooling were not observed. In examining the patient's speech condition, he could not express even phonemes and syllables during the evaluation. After several speech rehabilitation sessions, we realized that the clarity of the patient's speech was very unintelligible and slow. The patient's speech disorder was diagnosed as severe flaccid dysarthria.

Rehabilitation programs

To help feed the patient, two compensatory methods and swallowing therapy were used:

1. In the compensatory method, the patient's swallowing was helped by controlling the head and proper posture.

2. In the swallowing therapy methods, first passive exercises were used, which included muscle relaxation on the muscles of the face and larynx and sensory stimulation inside the mouth, which did not require the patient's activity. However, 10 days after speech therapy (2 times 30 minutes each day) (for 40 days), the patient started with about ten cc of distilled water, which gradually increased. After about 40 days of hospitalization, the patient ultimately regained the ability to swallow normally, and only the range of movement of the tongue to move food was weak. With the passage of time and active and passive exercises on the tongue, he achieved proper performance. Common disorders in the patient's oral preparation phase include decreased sensitivity of the oral area to cold and heat, sometimes the strength and range of movement of the lips, decreased strength and range of movement of the tongue, decreased ability to raise the tongue, decreased lateral movements of the tongue, decreased strength of the cheeks, and decreased sensation inside the mouth.

The ultimate goal of the rehabilitation program is to increase and strengthen weak subjects, such as increasing the sensitivity of the oral area, increasing the sensation inside the mouth, increasing the strength of the cheeks, increasing the strength and range of motion of the lips, increasing the strength and range of tongue movements, increasing the ability to raise the tongue, increasing lateral movements after two months of treatment, the patient achieved proper performance in these fields. Hot and cold spoons were placed on the tongue and lips to increase the patient's oral sensation. To increase the sensory awareness and the blocking of the lips, putting the lips together passively and applying pressure from the therapist were used. Stimulation was applied from the corner of the lip to the cheekbone, and cold was used to increase sensory awareness and cheek muscle stimulation. Abslang was used to increase the muscle tone and stimulate the muscles of the

cheeks in such a way that with the help of abslang, circular and back-and-forth movements were massaged with gentle pressure on the inside of the cheeks. To increase the sensation of the tongue, and stimulate the tongue muscles, pressure (from back to front) was applied to the tongue with the help of abslang and gently hitting the tip of the tongue in the right and left directions. To increase muscle strength, the patient was asked to close the lips tightly and smile after releasing. At the end of this exercise, the muscle and motor strength of the right side improved compared to the left side. In addition, the patient was asked to lift the tongue, and press behind the front teeth, and try to move backward on the hard palate, and finally, a good movement was observed up to the hard palate halves.

As mentioned, one of the common symptoms of the patient's oral swallowing disorder is food remaining on the hard palate and tongue. To increase the tongue base control, to increase the bite control, and to reduce the premature fall of the bite into the pharynx, the patient was asked to sit at 90 degrees with the therapist's help and bend his head down until the chin goes down to the chest and the bite swallows with the greatest strength.

The symptoms of pharyngeal phase disorders of the patient's swallowing, coughing during swallowing, aspiration, and penetration of substances into the airway can be mentioned. After the patient's liquid and solid swallowing treatment, the necessary exercises to work on his speech began. Most of these exercises were performed actively, movements, such as pursed lips, smiling, blowing lips, sticking out the tongue and moving to the left and right, moving the tongue out and in quickly, increasing the speed of tongue movements, moving the tongue in a circular motion on the upper and lower front teeth, applying pressure of both lips on each other. After performing these active and sometimes passive exercises, the function of the oral muscles for speech improved relatively well so that the patient could say words such as dad/mom/water/juice/fruit/banana/uncle/aunt within a week of working. Express/yogurt/milk/car/pain/bad without loudness and only with oral movements. Gradually, by increasing the expression of words, the patient could say sentences of two or three words, which at first were associated with loudness and low clarity. Over time, the speech therapy exercises increased a lot, and the patient's cooperation increased so that after 90 days, the patient could speak with appropriate volume and quality along with proper exhalation and breathing capacity. At the same time as working on speech, the patient's ability to write was worked on for better communication, and with the efforts of the occupational therapist colleagues and work on the fingers of the right hand; the patient could express part of his requests with the help of writing.

At the beginning of the hospitalization, the patient's communication process was only through left eye movements and pointing. However, the process of pointing has increased, and finally, pointing, saying words, and even simple sentences without sound and writing are used for communication and requests. Slow a syringe was used first, a glass was used to swallow the patient's liquids. In such a way that when he discharges himself, he holds the glass in his hand and consumes liquids with the glass. By increasing the pressure inside the mouth and increasing the strength and range of motion of the lips, the ability to suck bony liquids has also been developed in the patient.

Discussion

The present study was conducted to investigate rehabilitation strategies for dysphagia and speech disorders in patients with severe concussions. According to what was said, the studied patient suffers from both speech and swallowing disorders. The patient in question can see the increase in pressure inside the mouth and the increase in the strength and range of motion of the lips, the ability to suck liquids with a straw and swallow solids, as well as the clarity of speech in the patient. A review of studies and clinical experience shows that swallowing disorders are reported abundantly in these patients [9]. Swallowing disorders caused by concussions are very complex, and various factors are involved in how they occur. Therefore the manifestations of swallowing disorders are different in different patients caused by concussion. For this reason, the implementation of traditional treatments without support and not considering the type of clinical manifestations of this disorder in other people will cause a lack of effectiveness and progress of the therapy; therefore, for each patient with dysphagia and dysarthria, a unique and specific treatment should be designed based on the recovery of the disordered components [12, 13]. However, before the treatment, all the communication, behavioral, cognitive, movement, speech, and nutritional components of these patients should be examined and evaluated to guide the therapist in designing a precise and unique treatment plan. The rehabilitation program of these people is often a combination of different treatment methods. All these methods are adjusted to improve normal swallowing functions and increase speech clarity and communication skills. As mentioned earlier, our patient had severe muscle weakness of the speech and respiratory system and a severe inability to articulate consonants and words, which showed significant changes in speech clarity at the end of the treatment period. Therefore, to communicate verbally, in addition to increasing the time of phonation and correct articulation of spoken consonants, the loudness and rate of speech also increase.

Conclusion

One of the most common post-traumatic disorders in people is dysphasia, as well as speech disorder, which seriously threatens a person's life due to the multifactorial nature of the cases involved. Therefore, it is necessary to investigate the condition of these two disorders. Then a comprehensive and unique treatment plan is designed. Therefore, one of the vital things is to deal with step-by-step treatment plans from simple to complex, and regular assessments during the patient's rehabilitation will be effective. According to what was mentioned, during the 40-day treatment period from the time of admission, the present patient ultimately regained the ability to swallow normally, and the only range of movement of the tongue to move food was weak, which, with the passage of time and active and passive exercises on the tongue muscle good performance was achieved. Also, after 90 days, the patient could speak well, therefore his speech was clear and he had adequate breathing capacity.

Ethical Considerations

Compliance with ethical guidelines

This research was approved by the Vice Chancellor for Research, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran (Code IR.USWR.REC.1402.251).

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Authors' contributions

Conceptualization and supervision: Morteza Farazi and Seyed Majid Akhvan Hejazi; Methodology and writing the original draft: Morteza Farazi and Niyayesh Aali; Investigation, Review and editing: All authors.

Conflict of interest

The authors declared no conflict of interest.

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