Amyotrophic Lateral Sclerosis

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**Background:** Amyotrophic Lateral Sclerosis is a progressive and fatal disease that is characterized by motor neuron deterioration within the body. Degeneration, in turn, leads to a bulbar dysfunction in the form of impaired swallowing and communication. It is not known that lingual endurance and strength training have a role in communication, airway safety, lingual strength, and endurance in amyotrophic lateral sclerosis. Therefore, this study is conducted to determine the effect of linguistic resistance training on communication and lingual strength. **Methods**: Two individuals with ALS were included in this study. Swallowing, tongue strength and communication outcomes were noted. **Results:** Little improvement was reported for speech intelligibility during swallowing, communication effectiveness, quality of life and swallowing impairment remained stable in both participants. **Conclusion:** Slight improvement has been seen in communication and linguistic strength. Further studies are needed to validate the preliminary findings of this study.

**Introduction**

 Amyotrophic Lateral Sclerosis (ALS) is defined as a neurodegenerative disease characterized by progressive and rapid degeneration of motor neurons in the peripheral and central nervous systems. Amyotrophic Lateral Sclerosis is categorized as the terminal disease with no cure and represents one of the most common motor neuron diseases with an estimated prevalence of 12000 and incidence of 1.6/1000 individuals in the United States. Men are at more risk in developing ALS than women and the average onset of the disease is 65 years. The life expectancy ranges from two to five years and mainly depends on the type of disease onset (Andrenelli et al., 2018). Almost 70% of amyotrophic lateral sclerosis patients are presented with spinal onset, whereas 30% with a bulbar onset. The ALS with bulbar onset is mainly characterized by the development of swallowing and speech deficit (Rong & Green, 2019). On the other hand, individuals with spinal onset experience initial symptoms in the musculature of limbs. Regardless of the type of disease onset. All people with ALS develop problems related to respiration, swallowing, speech, and muscle weakness at some point during the disease course. Due to the inevitable fatal outcome of Amyotrophic Lateral Sclerosis, it is difficult to determine the appropriate therapeutic interventions (Andersen et al., 2018; Bandini et al., 2018).

Amyotrophic Lateral Sclerosis includes disorders such as Huntingdon's disease and Parkinson's disease. ALS includes the involvement of both lower motor neurons and upper motor neurons. Due to muscle fiber denervation, weakness is one of the most profound features in ALS development. In initial stages of the disease, the weakness is restricted to a focal body area such as neck, head, and limb region. The symptoms which result from a bulbar dysfunction in the bulbar region include dysphagia (swallowing impairment) and dysarthria (speech impairment). Concerning the disturbances in communication, it is estimated that 80-95% of individuals with Amyotrophic Lateral sclerosis will lose their ability of natural speech.

**Purpose**

The current treatment strategy for swallowing and speech dysfunction in Amyotrophic dysfunction is lacking and usually focuses on the management of symptoms via dietary and environmental support (Miller et al., 1999). Previously little evidence was present regarding the effect of mild to moderate exercise at an early stage of the disease. It can be beneficial in ALS but is not known that there is an impact of lingual resistance training on airway safety, lingual endurance, patient communication, swallowing and quality of life, and disease progression. Therefore, this report will focus on linguistic resistance training on lingual strength and endurance. It is hypothesized that an 8-week training of linguistic resistance can lead to increased isometric lingual pressure as well as a longer duration of lingual hold time. This, in turn, will lead to functional improvement in speech intelligibility, airway safety, and slower disease progression (Kuruvilla-Dugdale & Chuquilin-Arista, 2017).

**Research problem**

It is not known that lingual endurance and strength training have a role in communication, airway safety, lingual strength, and endurance in amyotrophic lateral sclerosis.

**Method**

In these two individuals who are diagnosed with amyotrophic lateral sclerosis are included. Participant X was a 51 years old woman with bulbar onset amyotrophic lateral sclerosis. She at a time of the study was 32 months post symptom onset. Participant Z was a 60 years old man with spinal onset amyotrophic lateral sclerosis (Robison, 2015). Complete demographic information was collected from each individual at the start. Due to the rapid neurodegenerative feature of ALS, several baselines were performed to benchmark the progression of the bulbar disease. Both participants underwent linguistic resistance training. Lingual strength was determined by the Lingual Pressure Generation, and the outcome variable was endurance and maximum anterior isometric pressure. The speech was tested by speech intelligibility test. The outcome variables were word and sentence intelligibility rating. Swallowing was tested by the videofluoroscopy and penetration aspiration scale (Jani & Gore, 2016). The speech intelligibility test was used to evaluate the speech intelligibility during the training session. In this, both participants were administered with a sentence and two-word intelligibility test. For this participant were seated comfortably. A microphone headset was placed on the head of the patients. Five patient-rated outcomes were administered, which include communication effectiveness survey, functional oral intake scale, swallowing quality survey, and eating assessment tool. The communication assessment tool was comprised of questions to determine how efficiently participants perceive their communication ability. These responses were ranked on a 4 ordinal scale in this score '0' indicates a person is not effective in communication whereas a score of '4' indicates that a person is very effective in communication. The total score was calculated after adding all scores of participants together. The swallowing ability of a person was determined by the eating assessment tool. There were seven questions, and in these 4 scales, the ordinal scale was used. In this score, '0' correlates to no swallowing problem whereas score '4' corresponds to severe swallowing problem. The quality of life survey regarding swallowing was done to determine the individual self-perceived quality of life regarding swallowing function (Tabor, Gaziano, Watts, Robison, & Plowman, 2016). This survey includes questions to determine how swallowing has an impact on attitude mood social role of the person. Both participants were told to complete the training session 5 days a week for the 8-week treatment period. The exercise included different swallowing performance task to help patients with efficient swallowing techniques;

**Results and Discussion**

In this study, the impact of linguistic resistance training on lingual endurance, lingual strength, and speech intelligibility were found. In this study, both patients showed no substantial improvement in tongue strength. However, the improvement was seen in the lingual endurance. One explanation for this is due to the unique tongue muscle fiber characteristics. There are primarily type 1 and type 2 fibers throughout the tongue muscle. Type 1 muscle fiber contracts slowly and are resistance to fatigue, whereas type 2 is fast contracting and are more susceptible to fatigue (Nijssen, Comley, & Hedlund, 2017). Airway safety remained unchanged during swallowing for participant A and remained stable for participant B. Perceptions of communication effectiveness swallowing impairment, and swallow-related quality of life was not affected by the lingual strengthening regime. Quality of life, swallowing impairment, and communication effectiveness remained stable.

**Conclusion**

It is not known that lingual endurance and strength training have a role in communication, airway safety, lingual strength, and endurance in amyotrophic lateral sclerosis. In this study effect of linguistic resistance training on communication and lingual strength was determined. Further studies are needed in this area.

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| **Part 1** |
| Name |  |
| Age |  |
| Gender |  |
| Date of Disease onset |  |
| **Part 2** |
|  | No problem  | Mild problem  | Medium problem | Severe problem |
| Swallowing problem leads to the loose weight |  |  |  |  |
| Swallowing issue interferes with my ability to take meals |  |  |  |  |
| Extra efforts are needed to Swallow the liquid  |  |  |  |  |
| Swallowing is painful  |  |  |  |  |
| Extra efforts are needed to swallow pills |  |  |  |  |
| Coughing is usually associated with swallowing |  |  |  |  |
| Swallowing is stressful  |  |  |  |  |
| **Part 3** |
| Having a conversation with friends and family at home |  |  |  |  |
| Participate in the conversation with unknown people in quite a place |  |  |  |  |
| Conversation with family on the telephone |  |  |  |  |
| Conversation with strangers on the phone |  |  |  |  |
| Part of conversation in noisy environment  |  |  |  |  |
| Have a conversation while traveling |  |  |  |  |
| Speak to a friend when emotionally angry and upset |  |  |  |  |

**Appendix**

**Questionnaire**