

Enhancing Dysphagia Rehabilitation through a Mobile-Based Digital Therapeutics : A Pilot study

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INTRODUCTION

Swallowing difficulties significantly impact quality of life, necessitating assessments like the videofluoroscopic swallowing study (VFSS) for effective rehabilitation. The recent pandemic has hindered daily high-quality rehabilitation, especially for outpatients. Telepractice using mobile devices provides accessible, safe dysphagia rehabilitation, maintaining patient motivation. This study aims to enhance engagement using a novel digital therapeutic (DTx) app for dysphagia rehabilitation, leveraging mobile device camera signals for patients with various conditions, including post-tumor resection or chemo-radiotherapy.

METHODS

This single-center, prospective case series pilot study included both outpatients and inpatients with dysphagia diagnosed after VFSS. Patients had various conditions like head and neck tumors (with/without radiotherapy), post-stroke, chronic illnesses, or degenerative diseases. A rehabilitation specialist assessed basic characteristics and PAS derived from VFSS. Patients with a PAS score >2 or oral/pharyngeal phase disorders on VFSS were selected.

Training session procedures

- 1) DTx app installation and training setup on personal mobile devices
- 2) Two sessions of swallowing therapy and DTx app education (T1)
- 3) Self-training with the DTx app for over a month
- 4) Follow-up VFSS evaluation (T2) of swallowing function using VDS.

Primary outcome assessment of PAS via VFSS.

Secondary outcomes VDS via VFSS, FOIS, PSS-HN for head and neck cancer, satisfaction, usability, and adherence based on app usage time.

Inclusion criteria

- 1) adults ≥ 18 years with dysphagia from head and neck cancer surgery/chemotherapy, cerebrovascular/neurodegenerative diseases, or neuromuscular diseases
- 2) PAS score ≥ 2 by VFSS
- 3) able to sit for ≥ 30 minutes,
- 4) no significant cognitive impairment and mobile device access (MMSE >24).

*Patients needing hospitalization or surgical treatment during the study were excluded.

RESULTS

- 7 cases were included, 1 withdrawal (2 strokes, 2 head and neck diseases (1 cancer, 1 deep neck infection), 2 Parkinson's disease (PD), 1 NMD)
- Avg. MMSE 29, age 51.7
- PAS scores improved from an average of **4.67 to 3.17**
- VDS scores improved from an average of **17.0 to 13.3**
- FOIS scores increased from **4.83 to 5.33**
- The average total usage time of DTx application was **8.5 hours per month**. (Figure 2)



Fig 1. Use of digital therapeutic device (DTx) during dysphagia training in a patient with head and neck cancer

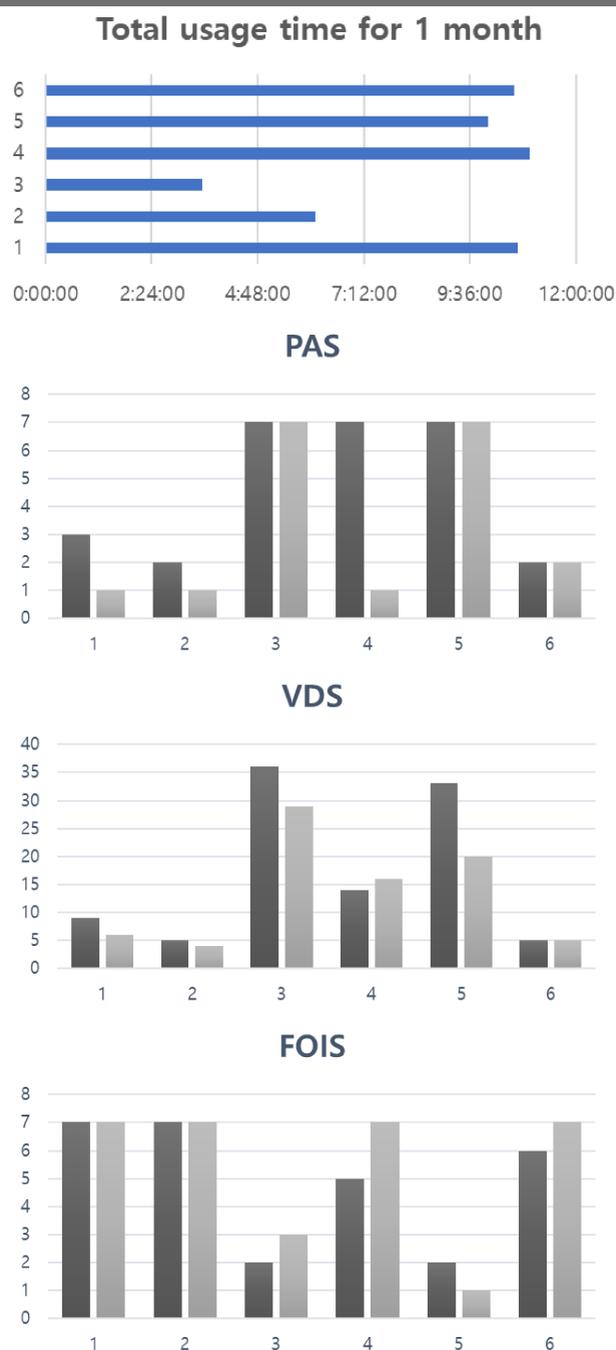


Fig 2. The results of digital therapeutic device (DTx) : The total usage time, Penetration-Aspiration Scale (PAS), Videofluoroscopic Dysphagia Scale (VDS), and Functional Oral Intake Scale (FOIS).

CONCLUSION

In this pilot study, we evaluated a digital therapeutic (DTx) developed to enable home-based training for patients with dysphagia. The results indicate that the use of DTx, in addition to conventional dysphagia therapy, can potentially increase the amount of training time for patients who otherwise have limited training opportunities. Future research will be needed to examine whether patients with higher doses and more intensive training could achieve greater improvements in dysphagia symptoms.

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