EMST150™ Device for Covid-19 associated Dysphagia and Hypophonia

Ravi Kasi, MD[a]; Elizabeth Biggio, CCC-SLP[b]; Corrina M Fukushima[c], Nakib Mansuri[d], Daniel McKee[e], Timothy M Curtis[c]

Introduction

Patients who suffer Covid-19 infection are at high risk for compromise to the respiratory system as evidenced by the high rate of ARDS and acute hypoxic respiratory failure. As a result of prolonged hospitalization and intubation, these patients developed a variety of medical sequelae including dysphagia and hypophonia. Due to restrictions with types of therapy able to be offered (i.e. standard aerosolized treatments) and restrictions with easy entry into patient rooms, EMST150™ was introduced as a novel treatment option with or without a therapist present.

EMST150™

EMST150™ is a pressure-threshold device that assists with strength training of the respiratory and oropharyngeal muscles. The device has a spring-loaded valve with an adjustable dial allowing varying amounts of pressure (i.e. resistance). If the patient expires strong enough, the spring-loaded valve will open allowing air to flow providing biofeedback to the patient. The target pressure to open the valve can be increased or decreased to change the physiologic load on the expiratory muscles to gradually increase the PEmax value[2]. EMST150™ devices have been shown to be efficacious in treating swallowing and speech disorders in a variety of neurological diseases. The theory is based upon the belief that reduction in expiratory muscle strength may decrease the ability to generate enough expiratory force to produce vocalizations or clear the airway. Thus, EMST150™ aims to strengthen the expiratory muscles with the use of resistant or pressure threshold technology[1]. There have numerous studies that have demonstrated improvement in speech quality & cough quality in Multiple Sclerosis, swallowing function in Parkinson's Disease, and lower rates of respiratory complications in Stroke patients with the use of EMST150™

Affiliations
[a]Rush University Medical Center, Chicago, IL
[b]Department of Speech Language Pathology, Rush University Medical Center, Chicago, IL
[c]Rush Medical College, Chicago, IL
[d]Rosalind Franklin University, Chicago, IL
[e]Loyola Stritch School of Medicine, Chicago, IL

Sources/Links:
1. Laciuga H, Rosenbek JC, Davenport PW, Sapienza CM. Functional outcomes associated with expiratory muscle strength training: narrative review. J Rehabil Res Dev. 2014;51(4):535-546. doi:10.1682/JRRD.2013.03.0076
2. Pitts T, Bolser D, Rosenbek J, Troche M, Okun MS, Sapienza C. Impact of expiratory muscle strength training on voluntary cough and swallow function in Parkinson disease. Chest. 2009;135(5):1301-1308. doi:10.1378/chest.08-1389
3. https://dysphagiacafe.com/2016/10/01/take-breath-away-expiratory-muscle-strength-training-improve-deglutition-cough-functions/#:~:text=EMST%20is%20implemented%20by%20hand,requiring%20increased%20respiratory%20muscle%20force
4. https://emst150.com/post-covid-19-rehab-program/

Trial of EMST150™ in Inpatient Rehabilitation

During the Covid-19 pandemic, our inpatient rehabilitation unit created a Covid Rehabilitation Unit. Amongst the many sequala from the disease, virtually all of the patients had some diminished pulmonary function. Considering the known correlation between poor pulmonary function and hypophonia & dysphagia, we introduced the EMST150™ as a novel treatment option.

We identified 7 patients admitted to acute inpatient rehabilitation to be treated with EMST150™ device following a medical admission for Covid-19 pneumonia who required prolonged intubation and had persistent dysphagia and hypophonia. Medical clearance to use the EMST150™ was provided by Rush University Infection Control team. All of the EMST treatment sessions were conducted under the supervision of speech therapy. During the initial treatment session, the specific amount of pressure (i.e. resistance) adjusted on the EMST150™ was individualized with any further adjustment completed on a case-by-case basis with subsequent treatment. The patients were encouraged to the use the EMST150™ device in-between treatment sessions without adjusting the pressure. However, is it unclear to the extent that this was accomplished.

At the time of discharge, there was an association with the use of the EMST150™ device and improvement with hypophonia and dysphagia as noted in in the table below. There were no adverse events associated with the use of EMST150™. Limitations of this trial included the low sample size. As a result, it is unknown if the recovery process was secondary to natural recovery from Covid-19 or was expedited secondary to the use of the EMST150™. Considering the promising published studies for neurological and pulmonary conditions, further larger scale study would be recommended regarding the use of EMST150™ for Covid-19 recovery

Results

	Sex	Age	Intubation status	Admitting Diet	Discharge Diet	Admitting Voice Severity	Discharge Voice Severity	# EMST sessions
1	M	57	16 days	Puree with honey thick liquids	Dysphagia with thin liquids	Marked	Mod/ Marked	2
2	M	74	27 days	Puree with honey thick liquids	Mechanical Soft with thin liquids	Mild-Mod	WFL	5
3	F	34	26 days	Puree with honey thick liquids	General with thin liquids	Mod-Marked	Min-mild	7
4	F	33	22 days	NPO	Pleasure feeds of Nectar thick liquids by tsp and puree	Severe (Aphonic)	Severe (aphonic)	4
5	F	76	22 days	NPO	Mech Soft with Nectar thick liquids	Severe	Moderate	6
6	F	55	15 days	Puree with honey thick liquids	Mechanical Soft with Thin Liquids	Mild-Mod	Mild-mod	4
7	M	67	8 days	NPO	Puree with Nectar thick liquids	Mild	Mild	5