

Use of Expiratory Muscle Strength Training to improve voice and secretion management after laryngectomy

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INTRODUCTION

Expiratory Muscle Strength Training (EMST) strengthens expiratory muscles and improves maximum expiratory pressure with associated positive impact on cough, secretion clearance and communication. Application of EMST has not been investigated in **people with laryngectomy (PWL)** to ascertain whether the same positive impact could be achieved despite the altered upper airway anatomy.

Laryngectomy is a surgery which involves complete removal of the larynx and vocal cords. After laryngectomy generation of subglottic pressure, which is required in order to cough, is therefore not possible. Instead of producing a conventional cough, PWL rely on the internal intercostal and abdominal muscles alone to generate sufficient expiratory force to mobilise secretions.

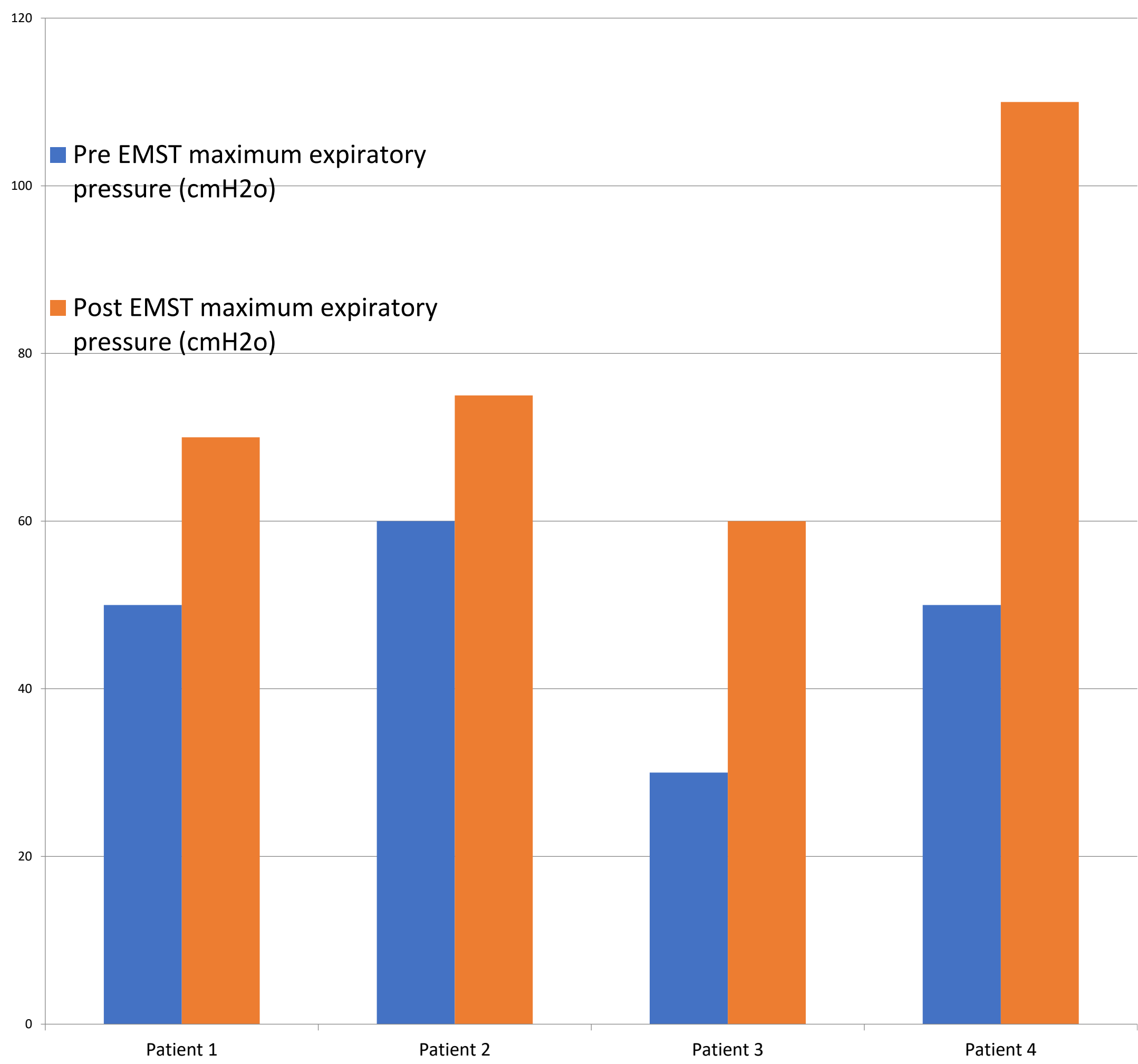
It is hypothesized that, following a course of EMST, PWL will notice a functional improvement in their ability to generate a forceful expiratory pressure which is sufficient to clear secretions in the absence of a conventional cough. We also hypothesise that EMST will improve tracheoesophageal voice quality through strengthening of the expiratory muscles to improve breath support, stamina and neopharyngeal airflow.

We present a pilot study on the use of EMST within the laryngectomy population. An EMST 150 device₂ was applied directly to the neck stoma with adaptations depending on stoma topography e.g. use of a Kapitex gel spacer to improve air seal.

AIM

- Completion of a pilot study to assess:
- Whether the existing EMST150 device can be successfully used at the neck stoma for PWL
 - If attending a five week EMST programme with daily adherence to exercises (five repetitions, five sets per day) is acceptable to PWL
 - Whether EMST improves maximum expiratory pressure, self-rated secretion management and perceptual tracheoesophageal voice quality in PWL

EMST150 device



RESULTS

	Tonicity rating (0=tonic voice)		Overall voice rating (4 point scale where 0= Excellent and 3= poor)		Features which improved with EMST
	Pre EMST	Post EMST	Pre EMST	Post EMST	
Patient1	-4	-3	3	2	Strain wetness, volume, whisper, fluency,
Patient 2	-3	-3	3	3	Stoma blast
Patient 3	-3	-1	3	2	Strain, wetness, volume, social acceptability, stoma blast, positive features of articulation
Patient 4	+3	+2	2	1	Volume, intelligibility, fluency, positive features of articulation

METHOD

A pilot study was carried out with four PWL who met the following criteria:

- At least one year post laryngectomy surgery
- Cancer free and not undergoing any active treatment
- Voice prosthesis user

Participants attended a training session where they were shown how to use an EMST150. A practice schedule was provided to guide a five week home practice programme.

Participants attended a face to face therapy session once per week to adjust the EMST150 device to maintain at 80% of maximum expiratory pressure and discuss any queries and check technique.

Baseline and post treatment assessments were completed using the following outcome measures:

- Maximum expiratory pressure measured using the EMST device
- Sunderland Tracheoesophageal Perceptual Scale (SToPS)₃
- Voice related quality of life (V-RQOL) scale₄
- Patient reported secretion severity index (adapted from the Cough Severity Index₅)

Qualitative interviews were carried out post treatment to capture participant experience.

Outcome measures were evaluated by Speech and Language Therapists who were trained in rating of the SToPs assessment and laryngectomy care.

CONCLUSIONS

- Pilot data from this study shows that EMST is an acceptable treatment for PWL which improves maximum expiratory pressure and impacts positively on some features of tracheoesophageal speech.
- All participants achieved increased maximum expiratory pressure at the end of the EMST program.
 - Analysis of voice using the SToPS assessment showed improvement in features of tracheoesophageal speech for all participants. Tonicity and overall voice rating improved in 75% of patients.
 - There was no significant change to patient perception of voice related quality of life or secretion severity. This may suggest that the outcome measures used were not sensitive enough to pick up changes in PWL, or that improvements noted by SLT as an experienced listener do not translate to functional changes noticeable to participants in their daily life. It is of note that these assessments are not validated for PWL as there is a lack of validated laryngectomy assessments.
 - Qualitative information gained from interviews suggested that EMST using direct placement at the neck stoma was acceptable to all patients. It also showed that patients noticed improvements in certain areas that were not directly assessed and therefore were not captured in the data e.g. vocal stamina and number of words per breath.
 - For the majority of patients, assistance or modifications to the basic EMST150 device were required to complete the program.
- These findings point to the need for a larger scale study with more targeted outcome measures and investigation of optimal treatment intensity.

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