PULMONARY REHABILITATION TO IMPROVE QUALITY OF LIFE AFTER TOTAL LARYNGECTOMY: THE USE OF HEAT AND MOISTURE EXCHANGERS.

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ABSTRACT

The Heat and Moisture Exchanger (HME) is used to compensate for the functions of the upper respiratory tract that are suppressed after a laryngectomy is performed. The results of various studies in relation to HME use clearly demonstrate that the use of HMEs in patients of total laryngectomy is associated with an improved quality of life.

KEYWORDS: pulmonary rehabilitation after total laryngectomy, heat and moisture exchangers.

INTRODUCTION

The upper respiratory tract has a well known effect on the physiology of breathing – humidification of inhaled air, retention of moisture from exhaled air, heating of the air that reaches the lower respiratory tract and filtering of particles and microorganisms.\[1-3\]

After a total laryngectomy, the upper and lower respiratory tract are permanently disconnected and the patient breathes through a tracheostoma. This causes alterations in lung function, such as a decrease in the mucociliary activity of the tracheobronchial tree,\[4\] irritation, dryness of the mucosa and a greater production of secretions. In turn, these alterations provoke an increase in coughing and forced expectoration, as well as excessive sputum production,\[5\] which get worse in the first 6-12 months after surgery, stabilising afterwards.\[6\]

Together with the loss of laryngeal phonation and cervical tracheostoma, the increase of lung symptoms participates in reducing the quality of life for these patients.\[5,7\]

THE HME KIT AND ITS FUNCTIONS

The Heat and Moisture Exchanger (HME) Kit consists of a plastic filter with internal aired foam and a hypoallergenic transparent adhesive that shall be placed around the stoma. There are round and oval adhesives that fit to each patient’s stoma’s size.

The Heat and Moisture Exchanger (HME) is used to compensate for the functions of the upper respiratory tract that are suppressed after a laryngectomy is performed. Its main characteristic, the exchange of heat and moisture, aims to restore the physiological function corresponding to the upper respiratory tract.\[8,9\] This is responsible, together with the increase in respiratory resistances and particle filtering, for the improvement of the lung symptoms in laryngectomized patients.\[10\]

Prior studies, most of them conducted at the Netherlands Cancer Institute by Ackerstaff et al.\[11-15\] with objective and subjective tests, have shown decrease of breathing problems and therefore the improvement of subject’s voice quality.

The pulmonary rehabilitation can be objectively evidenced by the significant increase on the values of inspiration volume.\[13\] Recently it was shown that the use of HME also resulted on increase of tracheal temperature by almost 9°C and the relative moisture in more than 20%.\[16\]

THE OUTCOMES OF HME SYSTEM

Though many studies have been published on the use of HMEs and their outcomes, the work of Bien et al.\[17\] (2010) deserves special mention, as far as the outcomes and results of HMEs are concerned. The study involved 80 laryngectomized patients who were randomized into two groups – the HME group (n = 40) and the Control group (n = 40). Patients in Control group were all offered the option to try the HME system after the study was finished. The study ranged over a time period of December 2007 to February 2008, in Poland. The average temperature at that time in Poland ranged from -1°C to +2°C. The assessment was done based on nine clinical parameters – compliance, frequency of coughing and forced expectorations, stoma cleaning, shortness of breath, fatigue, sleeping problems, voice and speech, psychological well being and HME use.
Compliance – the results in terms of compliance, demonstrated a 10% drop-out rate (4 patients). The remaining 36 patients had used the HME for 3 months. After a period of getting used to HME, 25 patients (70%) used the HME on daily basis and 18 used it day and night.

Coughing and forced expectoration – in relation to frequency of coughing and forced expectorations, the frequency decreased significantly in patients who used the HME for 3 months. This decrease was most significant in patients who used the HME day and night.

Stoma cleaning – regarding the parameter of stoma cleaning, there was a significant difference observed between the HME group and Control group. In the HME group, the frequency of daily stoma cleaning, reflecting crusting and overproduction of mucosal secretions in the tracheobronchial tree, reduced significantly.

Shortness of breath – both the HME users and the Control group experienced a decrease in shortness of breath at rest.

Fatigue – fatigue was evaluated on the basis of three parameters – feeling the need to rest, feeling weak and feeling tired during the past week. Overall, most patients (about 80%) reported no or only a little fatigue problem. There was no significant difference between the perception of fatigue in the HME group and Control group.

Sleeping problems – for evaluation of sleeping problems, the patients were asked about waking up at night and the use of sleeping medication. In the Control group, almost all patients (97.5%) had sleeping problems and this did not change over time. The HME group exhibited a reduction in sleeping problems, which was not significant but evidently noteworthy.

Voice and speech – in relation to voice and speech, the patients were asked to evaluate five different aspects of their speech – intelligibility, pitch, volume, fluency and intelligibility over the phone. A trend showed that fluency of speech improved in prosthetic speakers who used an HME. This is in concordance with earlier findings. About half of the patients found speaking with the HME easier and all patients found stoma occlusion easier.

Psychological well being – in the context of psychological well being, four parameters were employed for assessment – feeling tense, worried, irritable and depressed during the past one week. The results showed that feelings of anxiety and depression had significantly increased in the Control group. In the HME group, no significant changes in the feelings of anxiety or depression could be found.

HME use – as far as HME use is concerned, the usage of HME cassettes and adhesives decreased over time. During the first week of the study, on average 12.5 cassettes and 7.8 adhesives were used. During the last week, on average 9.5 HME cassettes and 6.1 adhesives were used. The usage decreased for both products, as the patients learned how to apply the adhesives and the secretions decreased.

Overall, all HME users were very positive about their experience. All patients felt that they had benefitted from using the HME and all but one would use the HME if it were prescribed by their physician and were covered by insurance. The results obtained in this study were similar to results published in other studies.

CONCLUSION
The results of various studies in relation to HME use clearly demonstrate that the use of HMEs in patients of total laryngectomy is associated with an improved quality of life.

CONFLICT OF INTERESTS
The author declares that there is no conflict of interests that could influence this work.

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