

# **OBJECTIVE AND SUBJECTIVE VOICE OUTCOMES AFTER TOTAL LARYNGECTOMY; A SYSTEMATIC REVIEW OF THE LITERATURE.**

K.E. van Sluis<sup>1,2</sup>, L. van der Molen<sup>1</sup>, R.J.J.H. van Son<sup>1</sup>, F.J.M. Hilgers<sup>1,2</sup>, P. Bhairosing<sup>1</sup>, M.W.M. van den Brekel<sup>1,2,3</sup>

<sup>1</sup>Netherlands Cancer Institute, The Netherlands

<sup>2</sup>Amsterdam Center for Language and Communication, University of Amsterdam, The Netherlands

<sup>3</sup>Academic Medical Center, University of Amsterdam, The Netherlands

Email address: k.v.sluis@nki.nl

**Background:** After total laryngectomy, patients, lose their natural voice, making restoring oral communication a major rehabilitation goal. The three main rehabilitation methods are esophageal, tracheoesophageal and electrolarynx speech. Aim of this systematic review is to compare objective acoustic, perceptual, and patient reported subjective outcomes for the above-mentioned rehabilitation methods and/ or with healthy speakers.

**Method:** A systematic literature search is performed in the databases PubMed, EMBASE, Scopus and PsychINFO. Articles published before January 2017 were assessed. Two independent reviewers evaluated studies on eligibility and quality.

**Results:** Of the 2,405 articles, twenty-six met the inclusion criteria and described one or more primary outcome measures of which three were rated with a low risk of bias (e.g. reporting methodological information). The remaining twenty-three studies were rated as unclear risk of bias.

In general, healthy speakers were rated as significantly better on acoustic parameters and perceptual voice quality and intelligibility. Significantly better outcomes are found in tracheoesophageal speakers compared to esophageal speakers for the acoustic parameters  $F_0$ , maximum phonation time and intensity. No acoustic analysis was performed on electrolarynx speakers. Perceptually, tracheoesophageal speakers are rated with a statistically significant better voice quality and intelligibility compared to the other speech rehabilitation methods. Esophageal speakers are perceptually rated with a statistically significant better intelligibility compared to speakers with an electrolarynx. No conclusions could be made in comparing patient reported outcomes of substitute voice speakers with healthy speakers. None of the speech rehabilitation methods is clearly indicated as achieving more satisfactory outcomes in self-reported vocal functioning. All substitute speakers report a decrease in voice quality.

**Conclusion:** All substitute voice methods are clearly deviant from healthy speech. The objective and subjective outcomes suggest that tracheoesophageal speech is considered as being more comparable to natural speech. The quality of most included studies is unclear; therefore the conclusion of most studies cannot easily be generalized. Other factors, such as costs or difference in health care system also have to be taken into account.