

A METHODOLOGICAL ACOUSTIC APPROACH OF LARYNGOPHARYNGEAL REFLUX DISEASE.

J.R. LECHIEN^{1,2,3}, C. FINCK^{2,4#}, K. HUET², M. KHALIFE⁵, A.F. FOURNEAU⁵, V. DELVAUX², M. PICCALUGA², B. HARMEGNIES^{2#}, S. SAUSSEZ^{1,3,5#}

Affiliations:

1. Laboratory of Anatomy and Cell Biology, Faculty of Medicine, UMONS Research Institute for Health Sciences and Technology, University of Mons (UMons), Mons, Belgium. Email: Jerome.Lechien@umons.ac.be; Sven.Saussez@umons.ac.be
2. Laboratory of Phonetics, Faculty of Psychology, Research Institute for Language sciences and Technology, University of Mons (UMons), Mons, Belgium. Email: Bernard.Harmegnies@umons.ac.be; Kathy.Huet@umons.ac.be; Veronique.Delvaux@umons.ac.be; Myriam.piccaluga@umons.ac.be
3. Department of Otorhinolaryngology and Head and Neck Surgery, CHU Saint-Pierre, ULB, Brussels, Belgium.
4. Department of Otorhinolaryngology and Head and Neck Surgery, CHU de Liege, Liege, Belgium. Email: Camillefinck@icloud.com
5. Department of Otorhinolaryngology and Head and Neck Surgery, RHMS Baudour, EpiCURA Hospital, Baudour, Belgium. Email: mohamad.Khalife@Epicura.be; anne-francoise.fourneau@epicura.be

Contributed equally to this work and should be regarded as *joint last authors*

Abstract

Objective: to explore the impact of the selection of the analyzed time interval on the significance of acoustic measurements used to investigate the treatment effectiveness of laryngopharyngeal reflux disease (LPRD), and based on these results, to develop an alternative statistical approach in data analysis focusing on individual patient vocal behavior.

Design: methodological prospective case series.

Methods: Eighty patients with a reflux finding score (RFS)>7 and a reflux symptom index (RSI)>13 were treated with pantoprazole 20 mg twice daily and diet behavioral changes for 3 months. Voice recordings and acoustic analysis were performed at baseline and after 3 months of treatment. Most stable time intervals of 1, 2, 3, 4, and 5 seconds, and a 1-second time interval positioned at mid-production, were subjected to acoustic analysis, all for the first, second or third sustained vowel. Based on the latter, we developed an "informativeness coefficient" for each acoustic parameter that aimed at assessing its sensitivity to clinical resolution in the case of LPRD.

Results: Significant clinical improvement (RSI & RFS) was observed after treatment ($p<.05$). Acoustic analysis revealed that acoustic measurements significantly improving from pre- to posttreatment varied across time intervals. The duration, the position of the analyzed time interval in the production, and the vowel on which the measure was done, yielded considerable differences in the results. Analysis of the informativeness coefficient indicated that Mean F0,

amplitude perturbation quotient (APQ) and Percent shimmer (Shim) were the indices most sensitive to medical treatment efficacy, with a coefficient ranging from 88% to 81%.

Conclusions: Depending on the selection of the time interval or the vowel (1st vs 2nd vs 3rd) over which the acoustic parameters are measured, the potential effect of the treatment may or may not be statistically demonstrated. Future studies are needed to establish standardized methodological procedures for acoustic data analysis.