HRM-assessment of the pharyngeal and upper esophageal sphincter function during singing

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Introduction

Classical singers often report swallow-related complaints during vocal performance such as:

- reflux complaints and/or swallowing difficulties
- an excess of air in the esophagus or saliva in the mouth
- throat clearing and/or coughing

Little is known about the types and prevalence of swallowing problems in singers. Only a few studies explored the effect of phonation on the UES and the pharyngeal function:

- more pharynx constriction with high frequency vocal activity [1]
- phonation-induced contractile reflex: higher UES pressure in phonation compared to prephonation [2]
- higher muscular UES pressure with pitch rising [3]
- higher prevalence of reflux symptoms in opera choristers [4]

Using High Resolution Manometry (HRM), this pilot study explores the effect of singing on the pharyngeal and upper esophageal sphincter (UES) function.

Objectives

The general aim of this study is to evaluate the relation between classical singing and the function of the UES and the pharynx.

The specific aims are to evaluate the effect on the UES and pharyngeal contractility of:

- Supraglottal versus glottal activity
- Frequency rising
- Voice onset
- Comfortable versus uncomfortable singing threshold

General methods

Subjects

- Ten experienced male (5) and female (5) singers (mean age = 32;08 y)
- 4 professional singers, 3 vocal students and 3 amateur singers
- Mainly selected from the Luca School of Arts in Music, Leuven, Belgium
- Classical background (singing)

Measurement techniques

1. Questionnaire: background information, swallowing complaints

2. High Resolution Manometry (ManoScan ESO): singing protocol (3 vocal exercises)

- Subjects had to repeat every exercise by rising a semi-tone until they reached their subjective uncomfortable pitch level
- Glottal activity: vocal chords tension (pitch rising, vocal and/or semi-vocal)
- Supraglottal activity: resonance, articulation (consonants)

Data analysis

1. Acoustical analysis (Praat): pitch analysis (minimum/maximum frequency of every repetition)
2. HRM-Analysis (ManoView 3.0.1.1.): pressure analysis in the pharynx and UES (vocal exercises)

- Analysis of every repetition (swallow frame)
- 5 pressure parameters (mmHg): Mean Pharyngeal Peak pressure Minimum, Maximum, Mean, Range UES pressure

Results

Supraglottal vs glottal activity

In exercises with high supraglottal activity, results show:

- Higher mean pharyngeal pressure (p=0.004)
- Lower minimum UES pressure (p=0.036)
- Higher UES range pressure (p=0.02)

Pitch rising

- Higher mean pharyngeal peak pressure with pitch rising (p=0.036)
- No effect of pitch rising on the minimum (p=0.49), maximum (p=0.54), mean (p=0.93) and range UES pressure (p=0.46)

Voice onset

- Higher mean pharyngeal peak pressure in exercises with voice onset (p=0.048)
- No effect of voice onset on the UES pressure parameters

Comfortable (C) versus uncomfortable (D) singing threshold

- No difference between C & D on the mean pharyngeal peak pressure (p=0.23)
- No difference between C & D on the maximum (p=0.31), mean (p=0.09) and range (p=0.28) UES pressure
- A trend towards a lower minimum UES pressure at uncomfortable singing threshold (p=0.079)

Discussion & Conclusion

- Pitch rising is associated with a higher mean pharyngeal peak pressure
- When singing on a uncomfortable singing threshold, results show:
  1. No effect on the pharynx pressure
  2. A trend towards a lower minimum UES pressure: indicating a more profound UES relaxation, which may potentially be a predisposition for gastro-esophageal reflux (GERD)
- This pilot study indicates that voice therapy could probably be an intervention for pharynx hypotension, but research in this regard is still in progress

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Bibliography


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