A SIMPLE TOOL FOR DISPLAYING SOUND PRESSURE LEVELS OF VOICE IN LARYNGOSCOPIC VIDEO RECORDINGS

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INTRODUCTION: Sound pressure level is an important parameter of voice production. In diagnosing voice disorders through laryngostroboscopy and videokymography it helps clinicians to quantitatively compare the vocal intensity produced during phonation with the underlying vocal fold vibrations. It is advantageous, if the laryngoscopic or videokymograpic setup has the possibility to measure and display the sound pressure level directly on the video frames. However, often the basic laryngoscopy or videokymography equipment lacks the inbuilt hardware capability to facilitate the sound pressure level measurements. A simple software tool is developed in this study to extract, quantify and display the sound pressure level directly from the recorded files, intended to benefit the clinicians for whom the hardware means of sound level measurement is not readily available.

METHOD: A custom MATLAB script (R2016a, The MathWorks, Inc., Natick, Massachusetts, United States) was written to extract the audio track from a video recording; measure and display the sound level in decibels (A or C-weighted) as standard subtitles on top of the video frames. In order to obtain calibrated dB levels, a simple calibration recording is needed and the microphone has to be placed always at the same distance from the mouth. Automatic gain control and noise cancellation effect should be disabled.

RESULTS: Figure 1 shows the recorded videokymographic images together with the measured sound level. Figure 2 shows a calibration setup during which an SPL of a stable sound played from a loudspeaker is determined by a sound level meter. The microphone M2 of the sound level meter is placed just next to the external microphone M1 (attached to the VKG camera), which captures the sound. This sound is recorded on the audio track of the video recording and is then used as a reference for calibrating the laryngoscopic sound recordings in clinical practice.
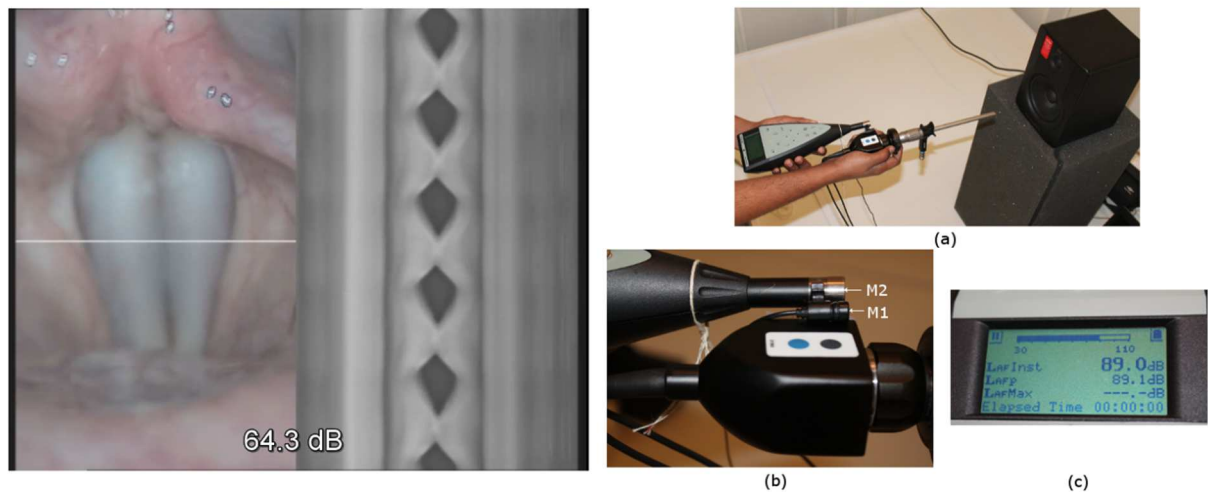

Figure 1 Sound level measured and displayed as subtitles in videokymographic frames

Figure 2 (a) Calibration setup, (b) detail of placement of microphones M1 and M2 for capturing the calibration sound, (c) sound level meter display showing the level of the calibration sound

DISCUSSION AND CONCLUSION: In contrast to the rather expensive audio and video equipment that is usually employed in complex laryngoscopic systems to measure and display the SPL in video frames, here we developed a simple software tool to achieve the same goal. This tool allows for more sophisticated evaluation of videolaryngoscopic and videokymographic recordings in normal voices as well as in patients with voice disorders.