

Device for palpation of laryngeal elevation and for the non-invasive diagnosis of dysphagia.

KEYWORDS

- ☐ DYSPHAGIA
- ☐ SWALLOWING
- ☐ LARYNGEAL ELEVATION
- ☐ VIDEOFLUOROS COPIC SWALLOW
- ☐ PHONIATRICS
- ☐ PROFESSIONAL AND ARTISTIC VOICE DISORDERS

AREA

- ☐ BIOMEDICAL

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Patent Type

Patent for invention.

Ownership

Sapienza University of Rome 100%.

Inventors

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Industrial & Commercial Reference

World companies that design, manufacturing and/or market for the diagnostic assessment of swallowing.

Time to Market

Prototype already built and applied on very few patients. The time to market placement depends on the engineering process times of the companies.

TRL 7 – system prototype demonstration in operational environment.

Availability

Cession, Licensing, Research, Development, Experimentation, Collaboration, Start-up and Spin-off.

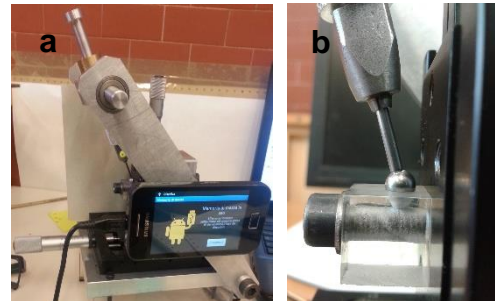


Fig. 1 Experimental set-up:

a) calibration bench; b) plexiglass phantom.

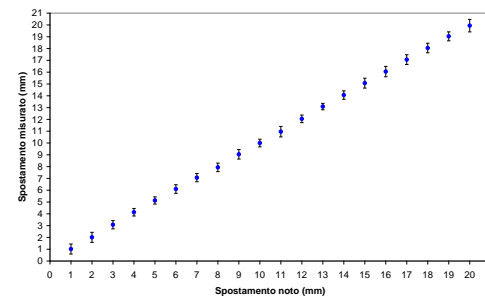


Fig. 2 Graph representing the results obtained with the Calibration procedure.



Fig. 3 Software implemented: a) acquisition of the video of the movement; b) elaboration of the markers placed on the device.

Abstract

The patented device is specific for the clinical evaluation in phoniatrics of swallowing dysfunctions.

The innovation with respect to the techniques current of diagnosis enables to measure with high accuracy, reliability and repeatability of the larynx displacement both during elevation that return, identifying the motion in the sagittal plane of the patient.

The patent consists of mechanical components designed for non-invasive diagnosis and non-X-ray patient exposure.

It has also been designed with the aim of applying new clinical protocols in the field of professional and artistic voice disorders.

Publications

- ❖ Ruoppolo G., Schettino I., Frasca V., Giacomelli E., Prosperini L., Cambieri C. Roma R., Greco A., Mancini, P., De Vincentiis M., Silani V., Inghilleri M. Dysphagia in amyotrophic lateral sclerosis: Prevalence and clinical findings Acta Neurologica Scandinavica, vol. 128:6, 397-401, 2013.
- ❖ Farneti D., Fattori B., Nacci A., Mancini V., Simonelli M., Ruoppolo G., Genovese E., The Pooling-score (P-score): Inter- and intra-rater reliability in endoscopic assessment of the severity of dysphagia, Acta Otorhinolaryngologica Italica, vol. 34: 2,105-110, 2014.



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Device for palpation of laryngeal elevation and for the non-invasive diagnosis of dysphagia.

Technical Description

The device consists mainly of a prismatic guide which applies a mechanically adjustable preload to the anatomical area of the larynx, known as the crico-thyroid space.

The scope is to reproduce the analogous mechanical coupling between the Foniatra index finger and the contact surface of the crico-thyroid space during palpation. Subsequently, the device was positioned and mechanically coupled with the anatomical landmark of a healthy subject and voluntary by means of a specially modified rigid orthopedic collar.

When measurement has been acquired, video of the movement and the elaboration of the respective frames can be estimated by means of software ad-hoc the spatial coordinates snapshots of two reflective markers affixed to the tip of the device.

Technologies & Advantages

The goal pursued for the design of the device was the elimination of the patient's exposure to X-rays by means of a non-invasive device. It was designed with mechanical components aiming of high reliability, accuracy and reproducibility of the displacement measurement during laryngeal elevation. The device is a valid alternative to current diagnostic techniques such as:

- VFS (Videofluoroscopy): gold standard for detecting laryngeal movements providing a dose of ionizing radiation to the patient.

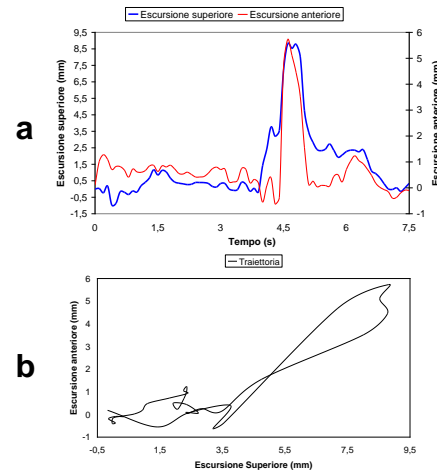


Fig. 4 Experimental results during the act of swallowing: a) laryngeal elevation along the x and y axis of the sagittal plane; b) trajectory of the displacement of the landmark of the crico-thyroid space in the sagittal plane.

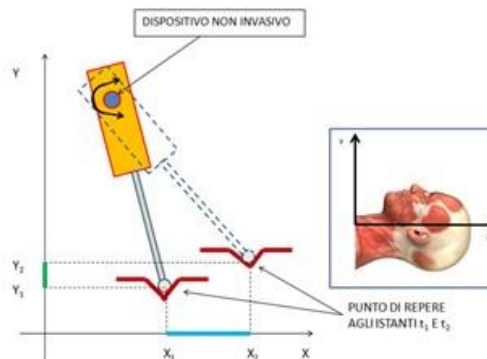


Fig. 5 Sketch of the operating principle of the device.

- FEES (Fiber Endoscopy Evaluation of Swallowing): qualitative and non-quantitative swallowing observation technique.

Applied design solutions have enabled the use of current consolidated technologies aimed at obtaining an easy-to-use device and possibility of not transferring the patient from the hospital bed (bed side diagnosis) with benefits in terms of management costs.

Applications

The area of interest is relevant to the National Health Service with interdisciplinary connotation given to the health professions involved in the field of Audiology, Phoniatrics, Speech and Otolaryngology.

An example of potential structures could be:

- University Hospitals,
- Hospitals,
- Private Clinics,
- Institutes for research, Hospitalization and Health (IRCCS)
- Specialized Clinics.

At present the evaluation is difficult to apply in Healthcare Residences (RSA) for the elderly, in a special way for debilitated subjects as it requires the displacement of the elderly in facilities equipped with the Radiological Room.

Also, as possible applications in the medium and long term is the evaluation of laryngeal excursion both in sportsmen and singers.

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