Mini Review

Translational medicine in dysphagia treatment

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Abstract

Dysphagia is prevalent in the general population, associated with significant morbidity and mortality and serious socioeconomic implications. There is extensive recent research in all aspects of dysphagia management. The aim of this review is to highlight top issues related to translational science in the field of dysphagia. Recent literature on dysphagia screening, diagnosis and treatment was reviewed to critically appraise areas of potential research translation to clinical practice and identify issues in need for further investigation before translation into practice or precision medicine is possible.

A key finding of our review is that an obstacle to research translation is the variability in the definition of dysphagia in research (swallowing safety, effectiveness, or both) and the diversity of phenotypes of most diseases related to dysphagia.

Review of the literature on screening, clinical evaluation, and instrumental tests documented the need for further improvement of patient-reported outcome measures and screening tests to meet adequate methodological criteria. Another finding is the ongoing research for further standardization, evaluation of the reliability of ratings and comparison of the diagnostic accuracy of Videofluoroscopy Swallowing Study and Fiberoptic Endoscopic Evaluation of Swallowing.

Translational research has shown potential for a future change in management strategies for head and neck cancer, to the direction of precision medicine and there is emerging evidence regarding the quantitative evaluation of head and neck cancer treatment-related dysphagia. Evidence is accumulating to support the effectiveness of strength training treatment protocols. Critical appraisal of the existing literature highlights methodological issues in need for further investigation regarding the application of non-invasive brain stimulation on dysphagic patients.

Diversity makes translational medicine in dysphagia difficult. Translation of the existing findings to clinical practice is accentuated by the extensive recent research in the field of dysphagia, pointing to an emerging potential to support precision medicine in the near future.

Dysphagia is a common symptom, associated with significant morbidity and mortality. Its prevalence in the general population has been reported to range from 13.5% to 22.6% [1-3]. It may result in dehydration, malnutrition, aspiration pneumonia and even death [4]. Dysphagia can have a profound impact on a patient’s life and also has severe socioeconomic implications [5]. Dysphagia is highly prevalent in the older population [6,7]. It is also associated with stroke [4,8,9], Parkinson’s disease [9-10], multiple sclerosis [11-13], head and neck cancer [14], neuromuscular diseases, trauma, dementia, gastroesophageal reflux and oesophageal diseases [5,7]. The exact epidemiological numbers remain poorly defined. This is partly due to the fact that dysphagia is a symptom and diversity of phenotypes is a typical feature of most diseases related to dysphagia. Diversity makes translational medicine and precision medicine in dysphagia difficult. There is extensive research over the past decade in all aspects of dysphagia prevention, diagnosis, and therapy. The aim of this review is to highlight top research issues related to translational science in the field of oropharyngeal dysphagia. Recent literature reporting on dysphagia screening, diagnosis and treatment was reviewed to critically appraise areas of potential translation of the existing research into clinical practice and identify issues in need for further investigation before translation into practice or precision medicine is possible.

Dysphagia is assessed by screening procedures, clinical evaluation/examination, and instrumental tests. Screening tests aim to identify the likelihood of a swallowing impairment in persons not previously identified as dysphagic. Clinical diagnostic tests serve to confirm the presence, location, and severity of swallowing impairment. Instrumental examinations utilize technology to observe swallowing via endoscopy, or dynamic imaging or measure dysphagia physiology and offer a detailed assessment of swallowing dysfunction and of the effectiveness of various eating strategies.

The combination of the three approaches is an established practice in the clinical setting. An obstacle to the process of translating research findings to clinical practices is the variability in the definition of dysphagia in research. Some articles define dysphagia on the basis of airway safety alone. A diagnostic test can have higher sensitivity for the diagnosis of aspiration than for the diagnosis of milder dysphagia events that compromise swallowing efficiency like pharyngeal food pooling.

All assessment tests need to be reliable, valid, and feasible, of high sensitivity and specificity. A paradigm of integration of research findings to clinical screening practice is stroke-related dysphagia. Evidence that early detection of dysphagia reduces pulmonary complications, length of hospital stay, and overall health care costs [15] led to the development of specific guidelines for screening stroke patients for dysphagia with validated tools [16]. Although stroke dysphagia

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screening guidelines are in effect for many years a recent systematic review critically appraised 35 published screening protocols, of which only two met adequate methodological criteria [17]. The difficulty in developing tests of high-quality overall is depicted to the fact that 34 dysphagia related Patient-reported outcome measures were published from 1987 until 2014 [18,19].

The Videofluoroscopy Swallowing Study (VFSS) and Fiberoptic Endoscopic Evaluation of Swallowing (FEES) are well established instrumental examinations of swallowing. Although a reporting scale for the main signs of dysphagia (bolus penetration and aspiration) has been published 20 years ago [20] and is systematically used in clinical practice and research, there is ongoing research for further standardization [14,21], evaluation of the reliability of ratings [22] and comparison of the diagnostic accuracy of VFSS and FEES [23,24].

Regarding genetic conditions related dysphagia, there is limited research relating endotypes and dysphagia phenotypes to guide evidence-based decisions for screening, diagnostic evaluations and treatment [25].

A common cause of dysphagia is head and neck cancer. Squamous cell carcinoma of the head and neck (SCCHN) is heterogeneous both clinically and biologically. Translational research has shown potential for a future change in management strategies for SCCHN to the direction of precision medicine [26]. There is emerging evidence regarding the quantitative evaluation of head and neck cancer treatment-related dysphagia [14,26]. These findings are valuable for the development of a personalized treatment deintensification paradigm.

Currently the management of dysphagia focuses on the prevention of complications while any natural recovery takes place and the implementation of exercise programs. Studies in healthy individuals and dysphagia populations inform evidence-based decisions about treatment protocols. Most therapeutic exercise programs used to treat dysphagia include isometric lingual strength training. Only recently evidence is accumulating to support the effectiveness of such treatment protocols and guide patient selection, type and length of training regimes [27].

Recently there has been interest in the role of neuromodulation to treat dysphagia. The central neural processing of swallowing has been extensively investigated over the last two decades. Non-invasive brain stimulation techniques were used initially to explore the physiological swallowing mechanisms in healthy subjects [28,29]. Later on a number of studies investigated the efficacy of transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) in the management of neurogenic dysphagia [30-32]. To date it is difficult to draw conclusions for the efficacy of these techniques. Reviews of the few relevant randomised controlled trials in the literature showed a moderate significant positive overall effect. There were many methodological differences across research studies, including patient characteristics, accounting for the still existing controversy as to which site to stimulate, strength and duration of stimulation [31,32]. Further research is needed to investigate the application of non-invasive brain stimulation on dysphagia patients prior to the translation into clinical practice for dysphagia rehabilitation.

Diversity makes translational medicine in dysphagia difficult. Translation of the existing findings to clinical practice is accentuated by the extensive recent research in the field of dysphagia, pointing to an emerging potential to support precision medicine in the near future.

**Authorship**

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**Conflicts of interest**

The authors Athanasia Printza, MD, MSc, PhD, Jannis Constantinitidis, MD, PhD, Stefanos Triaridis, MD, MSc, PhD, declare that there is no conflict of interest related to this paper.

**Ethical approval**

This study was performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments.

**References**


