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Review

Treatment effects for dysphagia in Parkinson's disease: A systematic review

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ABSTRACT

Background: Dysphagia remains a common problem in Parkinson's disease (PD). Previous systematic reviews on therapy effects for oropharyngeal dysphagia in PD have shown a lack of evidence. In the past 5 years several placebo or sham-controlled trials with varying results have been published.
Objective: The aim of this systematic literature review is to summarize and qualitatively analyze the published studies on this matter.
Method(s): Studies published up to December 2013 were found via a systematic comprehensive electronic database search using PubMed, Embase, and The Cochrane Library. Two reviewers independently assessed the studies using strict inclusion criteria.
Result(s): Twelve studies were included and qualitatively analyzed using critical appraisal items. The review includes rehabilitative (exercises, electrical stimulation, bolus modification etc.) and pharmacologic treatment. Some well-designed controlled trials were included. However, none of the included studies fulfilled all criteria for external and internal validity. A meta-analysis was not carried out as most of the studies were not of sufficient quality to warrant doing so.
Conclusion: Expiratory Muscle Strength Training (EMST) and Video-Assisted Swallowing Therapy (VAST) may be effective dysphagia treatments solely or in addition to dopaminergic therapy for PD. However, these preliminary results warrant further investigation concerning their clinical applicability, and further research should be based on randomized sham-controlled trials to determine the effectiveness and long-term effects of different therapies for dysphagia in PD.

1. Introduction

Parkinson's disease (PD) is characterized by motor symptoms including tremor, rigidity, postural instability, and bradykinesia. These symptoms are due to a gradual loss of dopaminergic neurons located in the substantia nigra [1]. However, many non-motor symptoms can manifest in PD, including autonomic dysfunction, neuropsychiatric symptoms, etc. [1–3]. The pathophysiology of the underlying oropharyngeal dysphagia is poorly understood. Dysfunction of the swallowing central pattern generator (brainstem) and degeneration of the substantia nigra seem to be important causes, and disturbance of nondopaminergic neural networks may be a major contributing factor [1,4,5].

One of the main causes of death in PD is pneumonia (4–30%) [2,6–8]. This is a multi-factorial problem which includes an altered oropharyngeal bacterial flora, immunocompromised health status, and aspiration due to swallowing disturbances, of which the latter occurs with a prevalence of 16%–87% [7,9]. Treating dysphagia might be one of the cornerstones to prevent pneumonia in patients with PD.

Furthermore, swallowing disturbances can have a major impact on quality of life in patients with PD [10,11]. Swallowing disturbances impair social interaction, give a feeling of fatigue, and decrease the pleasure and ability to select and consume various foods [12]. Therefore, treating dysphagia in PD is necessary in order to improve quality of life and to reduce mortality rates due to aspiration pneumonia.

Traditionally, swallowing is divided into four stages. The swallowing stages can be seen as a complex, sequential response along a continuum of automaticity, with the esophageal stage being most automatic and the oral preparatory stage the least [13]. In PD, disturbances may manifest in any stage of the swallowing process

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(oral preparatory, oral, pharyngeal, and esophageal stage). Abnormal bolus formation due to impaired lingual movements, aspiration due to delayed laryngeal movements, and impaired upper esophageal sphincter movements are common findings in PD [14].

Various treatments for dysphagia in PD have been described including surgical interventions, bolus modification, neuromuscular electrical stimulation, postural and airway protective maneuvers, and pharmacological interventions. Previous systematic reviews on different aspects of dysphagia treatment in PD show a lack of sufficient evidence due to the absence of controlled trials and due to small sample sizes [3,15–17]. Other systematic reviews have reported the effects of deep brain stimulation (DBS) and repetitive transcranial magnetic stimulation on dysphagia [18,19]. The aim of the current systematic review is to evaluate the latest literature concerning the effects of treatment for dysphagia in PD and to provide an evidence-based overview to aid in clinical decision making.

2. Methods

2.1. Identification and selection of studies

Two authors independently carried out the literature search using the electronic databases PubMed, Embase, and the Cochrane Library. They performed a search as listed in Table 1. The search was limited to articles published since June 2008 until December 2013. A previous systematic review by Baijens et al. [15] summarized the literature concerning the same subject until May 2008. Only articles on the effects of therapy for oropharyngeal dysphagia in Parkinson's disease were included. Studies describing treatment for esophageal dysphagia were excluded. In- and exclusion criteria are listed in Table 2. The reference lists of all the included articles were searched for additional literature, but did not yield any additional studies. It was decided to exclude patients with DBS since dysphagia has often been described as a side-effect of DBS [18]. A systematic review regarding this subject by Troche et al. [18] however, found no significant effect on swallowing after DBS in most included studies.

2.2. Data analysis and assessment of study quality

The quality of the overall study design was determined using the A-B-C rating scale by Siwek et al. [20]. Level A refers to high-quality randomized controlled trials, level B refers to well-designed, nonrandomized clinical trials, and level C refers to consensus or expert opinions. Furthermore, no validated instrument for assessing the methodological quality of therapy effect studies is available [21]. Therefore, a list of criteria for quality assessment was compiled, as derived from the studies of Jüni et al. [22], Crowe et al. [23], Katrak et al. [24], and the Cochrane Handbook for Systematic Reviews of Interventions by Higgins and Green [21].

Data extraction was performed by two independent reviewers and consisted of analysis of critical appraisal criteria per included study. The very few differences in rating were settled by consensus agreement after a discussion. If consensus could not be reached, a third review author was consulted for adjudication. The critical appraisal criteria were rated as 'yes', 'no' or as 'unknown' when insufficient information was provided and are summarized in Fig. 1. Criteria 1–2 were used to assess generalizability (external validity) and criteria 3–12 to assess reliability and risk of bias (internal validity). The present quality assessment tool, like many other validated ones, does not incorporate a quality score [21]. Finally, a meta-analysis was not carried out as most of the studies were not of sufficient quality to warrant doing so.

Table 1
Systematic syntax.

PubMed
((((“Parkinson Disease”[Mesh]) OR (“Parkinsonian Disorders”[Mesh]) OR (“Parkinson Disease, Secondary”[Mesh])) AND (“Deglutition Disorders”[Mesh] OR “Pneumonia, Aspiration”[Mesh] OR “Respiratory Aspiration”[Mesh])) OR ((deglut* OR swallow* OR dysphag* OR aspirat*) AND ((hypokinetic syndrome) OR Parkinson* OR (paralysis agitans))))
Embase
((swallowing/or dysphagia/or aspiration pneumonia/or food aspiration/or pulmonary aspiration/or aspiration/) and (parkinsonism/or Parkinson disease/)) or ((deglut* or swallow* or dysphag* or aspirat*) and (hypokinetic syndrome or Parkinson* or paralysis agitans))
The Cochrane library MeSH terms
([Deglutition Disorder] OR [Pneumonia, Aspiration] OR [Respiratory Aspiration]) AND ([Parkinson Disease])
The Cochrane library free-text
(deglut* or swallow* or dysphag* or aspirat*) and ((hypokinetic syndrome) or Parkinson* or (paralysis agitans))

Table 2
In- and exclusion criteria.

Inclusion criteria
Design
Peer-reviewed journal articles
English, German, French, Spanish, Portuguese or Dutch language articles
Studies with pre- and post-intervention data
$N \geq 10$
Participants
Patients diagnosed with Parkinson's disease
Patients with or without swallowing disorders
Patients without Deep Brain Stimulation (DBS)
Adults
Exclusion criteria
Studies presenting a consensus or an expert opinion
In vitro laboratory studies in experimental set-up
Studies involving experiments on animals
Studies involving experiments on cadavers

3. Results

3.1. General results

In total, 1442 articles were found in PubMed, Embase, and the Cochrane library databases, as displayed in Fig. 2. A first selection was made based on abstract and title by two independent reviewers. Next, the definite inclusion was made using the original full-text articles and the in- and exclusion criteria (Table 2). Finally, twelve articles were included for subsequent review.

Tables 3 and 4 summarize the data per study. They describe rehabilitative and pharmacologic treatments for dysphagia in PD. The classification of treatments was based on previous literature [15,25]. Surgical or dental treatment interventions for dysphagia in PD were not identified. The first column of each table represents the level of evidence according to Siwek et al. [20]. The Hoehn and Yahr scale (H–Y scale) [26] was used to assess the disease severity if present. Therapy, evaluation techniques, outcome parameters, "on/off" motor phase ("on" motor phase means within 90–120 min after the intake of antiparkinsonian medication), statistical analysis, and authors' key findings of the twelve articles were reviewed and summarized.

3.2. Methodological quality of included studies

Four level A and eight level B studies were included. Fig. 1 summarizes the critical appraisal criteria per study. None of the included articles met all critical appraisal criteria. Seven studies fulfilled all criteria for external validity [4,10,11,27–30] and five studies fulfilled one criterion [31-35]. Two studies met eight of the ten criteria for internal validity, thereby representing a low risk of bias [31,32], while two studies met six or seven criteria [28,35]. All other studies met less than six criteria for internal validity [4,10,11,27,29,30,33,34]. Criteria on external and internal validity could not be scored on 14 occasions because of insufficient reporting.

3.3. Rehabilitative treatments

Table 3 summarizes the data of the included studies on rehabilitative treatments. The studies are grouped according to the type of intervention. Nine studies concerning rehabilitative treatment were found.

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