Critical Review: Is a chin-down posture more effective than thickened liquids in eliminating aspiration for patients with Parkinson's disease?

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This critical review examines dysphagia management strategies and their ability to effectively eliminate aspiration for patients with Parkinson's disease. Three studies were reviewed, including two randomized control studies and a single-group (post) test only. Overall, the research does not provide sufficient evidence to support that a chin-down posture is more effective at eliminating aspiration when compared to thickened liquids, for patients with Parkinson's disease. The research does suggest that thickened liquids immediately eliminates the risk of aspiration. The long-term effectiveness of this treatment is not known. The findings from this review pose several recommendations to improve future research, including more detailed participant characteristics, more specific selection criteria, a more specific aspiration definition and assessment tool, and more consensus on the thickened liquid intervention strategies used in the research setting.

Introduction

Individuals with Parkinson's disease (PD) display a wide range of motor deficits that often includes dysphagia and deficits can occur in all phases of swallowing (Logemann, 1998).

The result of swallowing impairment is often aspiration. It is estimated that 50% of patients with PD have dysphagia, and one third of those patients are silent aspirators (Robbins et al., 2008). When compared to other groups of patients, aspiration tends to be more prevalent in patients with PD as the cough reflex, a primary mechanism of airway protection, is a complicated motor movement (Ebihara et al., 2003) with which patients with PD have difficulty. If aspirated material contains bacteria, the incidence of aspiration pneumonia is increased (Robbins et al., 2008).

Individuals with PD are often treated for dysphagia based on the clinician's clinical intuition (Garcia, Chambers & Molander, 2005). Garcia et al. (2005) conducted a survey in which clinicians agreed that thickened liquids was an effective intervention, even though the literature did not support the effectiveness of thickened liquids. Postural changes, such as the chin-down posture, are also often implemented. These methods of treatment are used because they produce instant beneficial results on the safety of the swallow (Logemann et al., 2008).

Previous research has not clearly identified a best-practice for eliminating aspiration in patients with PD. Therefore, it is necessary to examine the effectiveness of various strategies to ensure clinicians will be able to make accurate, informed decisions regarding their patients' care.

Objectives

The goal of this paper is to conduct a critical evaluation of the current research literature that investigates the effectiveness of varied dysphagia management techniques for patients with PD in eliminating aspiration.

Methods

Search Strategy

The computerized databases of PubMed, CINAL, and SCOPUS were searched using the following criteria: (parkinson* AND (treatment OR management OR therapy) AND (dysphagia OR swallow* OR deglutition)).

Selection Criteria

The articles included within this evaluation were required to examine rehabilitative or compensatory dysphagia management techniques used to treat aspiration for patients with PD. Pharmacologic treatments and surgical treatments were excluded from this review.

Data Collection

Given the objective and selection criteria explained above, the following types articles were included: randomized controlled trials (2), and a single-group (post)test only (1).

Results

Logemann et al. (2008)

This study aimed to investigate 3 dysphagia management techniques – chin-down posture, nectar-thickened liquids, and honey-thickened liquids – to determine which was most effective in treating aspiration for patients with PD and/or dementia. The researchers performed a randomized clinical trial with 711 patients (age range: 50-95 years) who aspirated on thin liquids. All patients received all three treatments in a randomized order and were assessed for aspiration using videofluorographic imaging. Results were analyzed using a McNemar test of classification agreement. The study found that aspiration was most often immediately eliminated with honey-thickened liquids (53% of patients aspirated), followed by nectar-thickened liquids (63% of patients aspirated), and then chin-down posture (68% of patients aspirated). Logemann et al. also examined the association between the interventions and the risk factors associated with aspiration using a repeated measures logistic regression. It was determined that patients with a gastrostomy tube were more likely to aspirate on honey-thickened liquids.

Robbins et al. (2008)

This study was a follow-up of the Logemann et al. study. Two intervention strategies – chin-down posture and 2 thickened liquid consistencies, nectar and honey – were compared to examine the 3-month cumulative incidence of definite pneumonia in patients with PD or dementia. 515 patients (age range: 50+) with PD or dementia who aspirated on thin liquids were randomly assigned to an intervention group. Cumulative incidence rates of pneumonia were calculated using the Kaplan Meier life table method. The study was terminated early, once the researchers determined they would not be able to reject their null hypothesis. The 3-month cumulative incidence of pneumonia was not significantly greater for any of the treatment groups. The study could not conclude which intervention strategy was superior.

Troche, Sapienza, and Rosenbek (2008)

This study examined how bolus consistency affects the penetration-aspiration (P-A) score and swallow timing in patients with PD. Ten patients with PD were assessed using videoradiographic imaging while swallowing six thin and six pudding-thick boluses. The researchers measured swallow timing and P-A for each patient. A MANOVA was completed to determine if gender and consistency had an effect on the dependent variables (oral transit time, pharyngeal transit time, tongue pumps, and P-A scale). The authors also used a Kruskal-Wallis to assess the effects of bolus consistency on the dependent measures analysis and Spearman's rho to examine the relationships between the dependent variables within the consistencies. The results of the study revealed various relationships and differences between oral transit time, number of tongue pumps, and P-A score. Specifically, it was determined that there was a significant difference in P-A score in relation to bolus consistency, with penetration and aspiration occurring on swallows of thin liquids. The results of the study also determined that there was no significant relationship between the dependent variables and P-A score with respect to either consistency.

Discussion

Logemann et al. (2008)

As the authors state, this study is the first randomized clinical trial of its kind. This study design indicates that the results from this study can be valued as a high level evidence.

The selection of participants for this study involved speech-language pathologists screening patients at the bedside for aspiration symptoms that "included throat clearing, cough, choking, or gurgly voice during, or after liquid swallows" (p. 175). This criteria does not include other symptoms that have been determined as indicators of aspiration, such as dysphonia, dysarthria, abnormal gag reflex, and abnormal volitional cough (Daniels et al., 1998). A consistent, standardized screening tool would have produced consistent across all speech-language pathologists involved in referring participants for this study.

The researchers also only included those individuals with the "ability to comply" (p. 175) with all three interventions. This inclusion criterion possibly eliminates patients with severe dementia and/or PD, who would add a more varied sampling of individuals with dysphagia and aspiration. This limited sampling suggests that the results from this study are only representative for a subset of individuals with dementia and/or PD.

The demographic data included lacked crucial details. While characteristics such as gender, age, and education level were reported, other variables (such as disease severity, previous treatment strategies used, medication information (e.g., levodopa), and absence/presence of head and neck dyskinesias) that could impact the effectiveness of certain management were omitted.

The procedures outlined by the authors are highly detailed, which allows for the possibility of easy replication of this study. However, there is no specific operational definition of aspiration mentioned. It is unclear whether all the local clinicians examining the videofluorographic images were following a consistent description of aspiration. A tool such as the Penetration-Aspiration Scale (Rosenbek et al., 1996) would increase the reliability of the examinations across all the participants. There is also no mention of interrater reliability, which further compounds this issue.

The authors appropriately used the McNemar test of classification, which is useful when comparing non-parametric data in "before and after experiments" (Marques de Sá, 2007), which in this study, refers to the absence/presence of aspiration was before and after the treatment method was applied.

A positive aspect of this study is the patient preference information. While effective dysphagia management techniques that eliminate aspiration are important, it is also pertinent to consider patient preferences in order to maintain adequate quality of life.

The study directly examined the research question of this review, and in spite of the methodological issues stated above, the findings of this study can be considered strong evidence.

Robbins et al. (2008)

In this study, Robbins et al. recruited their sample of participants from the pool of participants in the Logemann et al. study. This a follow-up study examined the three intervention strategies for aspiration over the long-term. The shortcomings of the participant selection and the poor demographic data explained previously are also relevant in this study. The authors also fell short of obtaining necessary sample size for achieving 90% power.

This article does improve on other limitations of the Logemann et al. study. The procedures are detailed and specific, giving the reader the confidence that the study can be replicated. Robbins et al. provide clear operational definitions of aspiration, definite pneumonia, and suspected pneumonia. The researchers provided rigorous training to those individuals administering the treatment, and also controlled for extraneous factors (e.g., clinician providing participants with other compensatory strategies).

As the authors point out, this study did not use a no-treatment control group as a means for comparison. Since the current literature regarding dysphagia management techniques for eliminating aspiration in patients with PD is very limited, incorporating a control group would have provided a much-needed comparison. The study could not suggest that cumulative incidence rates of pneumonia were lessened by any intervention since it could not suggest that receiving no treatment would have produced more adverse results.

The authors used a Kaplan-Meier estimate to analyze the data, which is a non-parametric method that calculates the probability of survival and produces estimated survival rates, allowing for the comparison of two or more treatments ("Kaplan-Meier estimate", 2007). This statistical measure is an appropriate tool since the authors wanted to compare the incidence rates of pneumonia across the different treatment groups.

An important component of this study is its inability to reject the null hypothesis, which resulted in the termination of the study. It is important to note that the authors did not terminate the study without first conducting a power analysis to ensure they did not ignore the possibility of Type II error. As Portney and Watkins (2000) explain, "researchers are often unable or unwilling to publish reports that end in nonsignificant outcomes" (p. 402). The authors' willingness to publish this demonstrates a resolve to contribute to the body of evidence in this field of the literature, which as previously mentioned, is lacking in quality and quantity.

The study's failure to demonstrate any trends in the data, and the subsequent termination of this study indicates that this study can be considered a low level of evidence. Therefore, Robbins et al., were not effective at answering the research question of this review.

Troche, Sapienza, and Rosenbek (2008)

This study, on a much smaller scale, succeeds in areas that the previous studies did not. The complete participant demographics are outlined, including disease severity (using the Hoehn and Yahr scale), duration of disease, and scores from the Unified Parkinson's Disease Rating Scale. Troche et al. also tested the patients at the most optimal time in their medication cycle and ensured that none of the patients exhibited any dyskinesias.

The procedures used are well-explained, which allows for replication of this study. The examiners were also

blinded to the participants' identity. The interrater reliability was reported, showing moderate to strong correlations.

The small sample size of this study calls its statistical power into question. With a sample of n=10, it is not likely that the results of this study is representative of the whole population. Troche et al. did not include a power analysis to calculate how many participants were needed in order to observe a significant effect.

The authors used an ANOVA to statistically analyze their data, which is an appropriate method to determine which variables (i.e., oral transit time, pharyngeal transit time, tongue pumps, and P-A scale) could be contributed to any differences the effectiveness of the bolus consistencies.

The bolus consistencies used – thin and pudding-thick liquids – are also not representative of the variability of bolus consistencies available for clinicians to prescribe for their patients; pudding-thick is only one of many consistency of thickened liquids. Despite the fact that Troche et al. suggest that the pudding-thick consistency is a more effective method to prevent aspiration, this is only in comparison to thin liquids. This leads to further questions for practicing clinicians. The researchers could have designed their study around 2 thickened bolus consistencies, much like the Logemann et al. and Robbins et al. studies.

This difference in methodology indicates that this article does not answer the research question of this critical review as effectively as the Logemann et al. study does. The reduced quantity and quality of information included (i.e., the small sample size and the limited treatment interventions) suggests that the findings of this study cannot be held with the same weighting. These findings provide a moderate level of evidence towards this field of research.

Conclusion

The literature reviewed in this paper does not provide sufficient evidence to support the claim that chin-down posture is a more effective means of eliminating aspiration for PD patients, when compared with thickened liquids. Despite the limitations of the studies by Logemann et al. and Troche et al., they both came to the similar conclusion that thicker liquids should immediately yield a safer swallow. However, the Robbins et al. study, which attempted to examine the long-term effectiveness of these treatments, could neither confirm nor refute this conclusion. Therefore, it can only be determined that thickened liquids are more effective at immediately eliminating aspiration.

Recommendations

Further Research

The methodologies varied greatly between the three studies examined. The assessment tools, interventions selected for comparison, and treatment outcome measures were different for each study. It is recommended that future research focus on developing a standard methodological procedure, specifically improving on the following:

a) More detailed demographic data and participant characteristics: future studies should clearly indicate the disease severity of all participants. If researchers include a wide range of disease severity, they should ensure that the participants are grouped according to severity, to determine if specific treatment methods are more effective at certain stages of the disease.
b) More specific selection criteria: as previously mentioned, Daniels et al. (1998) documented specific indicators and predictors of aspiration that could be used as a checklist to include or exclude patients from a study.
c) A more specific aspiration definition and standard assessment tool or criteria should be used to determine the absence or presence of aspiration. The Penetration-Aspiration Scale developed by Rosenbek et al. (1996) is a well-known and commonly used tool within the clinical setting that could provide consistent, reliable assessment results across all examiners.
d) More consensus on the thickened liquid intervention strategies: practicing clinicians have many degrees of bolus consistencies to choose from when selecting this treatment option. Future researchers should make an effort to use a wide range thickened liquids that are consistent with the options that are used within the clinical setting. This will allow for more accurate comparisons of the research literature. It will also create the possibility for stronger recommendations to be made with respect to treatment method considered best-practice for eliminating aspiration for patients with PD.

Regarding the research of the long-term effects of the dysphagia intervention strategies for patients with PD, many improvements can be made. The failure of the Robbins et al. study is partially due to the inconsistent method in which patients were monitored during their treatment trial. Long-term studies should be developed with careful consideration of the method and extent to

which patients will be monitored. In addition to this, the authors also did not consider other predictors of pneumonia. It has been well documented by Langmore et al. (1998) that dysphagia is not a sufficient indicator of pneumonia. Dysphagia must be observed in tandem with other risk factors, such as dependent for feeding, dependent for oral care and number of decayed teeth.

The large sample sizes of the Logemann et al. and Robbins et al. studies play a significant role in this growing area of research. These articles clearly prove that large-scale randomized trials can be conducted when examining dysphagia management for patients with PD. Future research should maintain this level of evidence, in order to produce results that can be considered valuable contributions to the dysphagia literature.

The authors of all three articles made considerable effort to produce significant results in a relatively limited field of research. The weaknesses of these studies serve to educate clinicians and researchers as to the necessity for stronger experimental studies in the area of dysphagia management for patients with PD, in order to develop a best-practice guideline for eliminating aspiration in patients with PD. This will provide practicing clinicians with the ability to make evidence-based, informed decisions regarding the appropriate treatment for their patients.

Clinical Implications

Based on the limited research that is available to clinicians, it is recommended that clinicians use thickened liquids to treat dysphagia for patients with PD. The different intervention methodologies from Logemann et al. and Troche et al. result in inconclusive findings in regards to which degree of thickness is most effective for eliminating aspiration for patients with PD. However, the articles provide a straightforward procedure that clinicians can use to develop their own evidence-based practice. Clinicians can carefully examine the effectiveness of the varying degrees of thickened liquids with their patients, and over time, it will be possible to develop a personal best-practice guideline. It is also necessary that clinicians stay up-to-date with the current research being conducted within this area. As dysphagia research advances and expands, there is a distinct possibility that the available treatment options and standards of patient management may continue to change.

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