The Consequence of Coordinated Respiratory-Swallowing Therapy on Chronic Obstructive Pulmonary Disease Patients

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Abstract

Background: Swallowing difficulties occur frequently and negatively affect patients living with Chronic Obstructive Pulmonary Disease (COPD), as it raises the chances of aspiration pneumonia. Our objective was to look at the effects of a chin tuck gesture when swallowing as an augmentation strategy on a targeted respiration swallowing therapy to enhance swallowing by reducing the risk of aspiration.

Methods: Prospective, randomized controlled trial study was conducted in major city Teaching Hospital with a hundred ambulatorily COPD patients with dysphagia to be included in the study. Participants either received the chin tuck strategy on a targeted respiratory swallow therapy or performed normal routines. The main outcome measure was the Penetration Aspiration Scale score before and after treatment. Secondary measures included SWAL-QOL changes, peak cough flow and FEV1 in 1 second.

Results: Hartman et al.'s baseline pneumonia aspiration score results indicated that the intervention group saw great improvement in pen a NA PM PAS scores ($p < 0.001$) as well as the restrictions on swallowing the functional swallowing lifestyle subcomponent in the SWAL QOL ($p = 0.002$). The strength of Callister's et al's cough also improved ($p = 0.04$) but the Responding-FEV1 was not statistically significant in the study.

Conclusions: In patients with COPD and dysphagia, the use of respiratory-swallowing therapy resulted in improved swallowing function and quality of life. This would likely advance the strategy to reduce the potential risks of aspiration and enhance the respiratory efficiency among this subgroup.

Keywords: Chronic obstructive pulmonary disease, Swallowing disorder, Functional therapy of swallowing and respiration, Aspiration, Life quality concerning swallowing, Randomized control trial.

Introduction

Chronic Obstructive Pulmonary Disease is a progressive lung disease which is characterized by not fully reversible limitation of airflow, which affects a normal respiration function to a great extent. It affects millions globally and is projected to rank among the leading causes of mortality and morbidity worldwide (Lopez et al., 2006). The clinical and pathophysiological relationships between emphysema and chronic bronchitis in patients with COPD tend to be quite complex and have many extrapulmonary consequences that can be severe in specific patients (Agusti, 2000).

Dysphagia in COPD

In the case of chronic obstructive pulmonary disease, swallowing mainstream might be a concern as people suffering from this disorder are clinically documented to have a hard time swallowing food, it might also be linked with some trauma as well. According to some recent studies and evidence, it is said that dysphasia is very prevalent within the lines of disability, between people suffering from the disease and its incidents may vary from 56% and above in some groups (Cvejic et al., 2011). Not only does this increase the chances of pulmonary infection being caused through aspiration but also decreases one's overall living standard leading to poor nutrition intake and body weight (Steidl et al., 2007).

Synchronization between Respiratory and Swallowing Patterns

Swallowing and respiration are pragmatic functions that comprise a common air way mechanism both anatomically and physiologically. When such synchrony is impeded, a person is at a higher risk of aspiration which is highly evident in some diseases like COPD which deteriorates breathing capacity. It has been noted that if the coordination between respiratory movements and swallowing could be ameliorated the chances of aspiration would be reduced therefore enhancing the safety and quality of life for such patients (Martin-Harris et al., 2005).

Approach towards Solving Issues and Proposed Solutions

Conventional approaches to tackle dysphagia may endorse aiding in the contraction of muscles responsible for the act of swallowing but breath timing of swallowing may not be tactically important. There is a body of literature supporting the idea of an intervention targeting the coordination of these two systems but there is a lack of evidence (Gross et al., 2009).

Reasons and Goals behind Conducting Research

Thirdly, Apart from the existing difficulties, this research aims to evaluate the outcome of a uniform co18ordinate respiratory swallowing therapy program intended for individuals with COPD. This follow-up research will seek whether these specific therapies will create better coordination between salivation and respiration thus aiming to decrease chances of aspiration and increase overall efficacy of the swallowing mechanism. These outcomes may have an important effect on clinical practice and suggest that the management strategy for patients with COPD should change to a more holistic approach catagoulding the cavities complexity.

Literature Review

Dysphagia in COPD

The difficulty in swallowing is known as dysphagia which is what, has been established as a real difficulty in people suffering from Chronic Obstructive Pulmonary Disease, (COPD) but is often overlooked as well. COPD patients suffering from dysphagia have been found to face an increased risk of aspirations which in turn is a risk factor for aspiration pneumonia which is a well known source of issues in patients with this chronic disease (Cvejic et al., 2011; Terada et al., 2008). There are various reasons for the development of such a condition with any person suffering from COPD, some of those reasons include restricted respiration, inability to cough properly and the alteration in the rhythm between the breathing and swallowing due to over inflation (Gross et al., 2009).

Respiratory do Swallowing Interdependence

Understanding the comorbidity between swallowing and respiratory coordination is quite important. Of consideration is the fact that the employing the coordination between the two functions has been seen to pose a risk to nomal function, hence breathing and swallowing do not occur simultaneously. Swallowing is usually found to occur when one is exhaling so as to reduce the risk of mistakenly inhaling the food during the course (Martin-Harris et al., 2005). Shaker et al. (1990) were the first to suggest that classifying swallowing and its treatment as a separate entity when looking at the interactions of a breathing space is not ideal especially for cohorts suffering from chronic pulmonary diseases.

Trustworthy Therapeutic Approaches to Dysphagia

In the past, the focus of the traditional dysphagia therapy has been on increasing the strength of the apparent hyoid and lingual muscles as well as modifying bolus consistencies. While these approaches may have some effectiveness, they don't usually solve the actual problem which is the impaired breath swallowing coordination which is common among COPD patients (Clavé and Shaker 2015). Some studies have appeared showing that techniques that modulate swallowing in relation to specific respiratory phases enhance swallow safety and lessen chances of aspiration (Wang et al., 2016).

Development of Efficacy for Coordinated Respiratory Swallowing Therapy

Needless to say, the recent research has started examining the possibility of combined respiratory and swallowing therapy in patients with breathing problems targeting better results. These studies demonstrated some results like decreased aspiration and better swallowing function in the patients who were taught to swallow during the ventilation cycle at scientists-recommended intervals (Sapienza et al, 2011). However, studies in this area are still in their infancy, and further studies are needed to develop appropriate standards and to evaluate long-term effects.

Research Gaps

While the previous research is important, there is considerable lacuna in practical clinical research in respect to formulating and validating suitable strategies for interventions that can be put into practice in standard clinical environments. Moreover, there are no comprehensive frameworks regarding how such therapies can be best fitting practices implemented across the complex clinical trajectories typical of COPD patients.

Study Design and Methods

Study Setting

The setting of the study was a tertiary hospital providing baseline information of randomized control trial assessing coordinated respiratory swallowing therapy on disabling dysphagia in patients with COPD.

Study Population

The organization prescribed that adult subjects who were 18 years and above with established signs of dysphagia should consent to partake in the study. Certain patients were excluded, including those suffering from COPD exacerbation within the prior month, those with other respiratory or neurological diseases that may interfere with swallowing processes, and those who had been operated on to correct swallowing

difficulties. After having been adequately informed, out of 100 patients, half were issued the control groups while the rest were issued the experimental group.

Measurement and Evaluation

Coordinated respiratory swallowing therapy was integrated into the normal pulmonary rehabilitation program of those placed in the experimental group. The focus was to teach the patients a strategy to swallow at the best time during respiration, in this case a breath out, just prior to a breathe in. The analysis and outcome measurement was carried out after six weeks of respiratory swallowing therapy which was conducted by swallowing and respiratory therapists twice every week.

Control Group

Patients from the control's group have carried on with their normal pulmonary rehabilitation program as well as the treatment that they were assigned to without receiving the coordinated swallowing therapy. This was in accordance with accepted COPD treatment guidelines, and encompassed muscle strengthening, and aerobic exercises while following basic structures of dysphagia management.

Outcome Measures

Primary Outcome:

- Improvement in swallowing function as determined through the Penetration-Aspiration Scale (PAS) during videofluorographic swallowing studies (VFSS) obtained at the beginning of the study and at the end of the intervention period.

Secondary Outcomes:

- Number of aspiration events that the participants suffered during the stipulated time of the study.

- The life score in relation to the swallowing function measured in a specific questionnaire called the Swallowing Quality of Life Questionnaire SWAL-QOL.

- Respiratory measures including Forced Expiratory Volume in 1 second (FEV1) and Peak Cough Flow (PCF).

Data Collection

Charts were collected at the beginning, immediately after implementing the changes, and after 3 months to see if the effects of the therapy weremaintained during this period. There were fixed questionnaires used to obtain population characteristics, history of diseases as well as treatment aspects.

Statistical Analysis

In this work, data processing was provided with SPSS 26 (IBM Corp, Armonk, NY, USA). Shapiro-Wilk tests for normal distribution were conducted. Changes in Relative and Absolute Pressure measurements ' mean values were studied within and between groups using the analysis of variance (ANOVA) with repeated measures and appropriate post-hoc tests. Categorical variables were analyzed using the Chi-square test. A p value set at 0.05 was taken as statistically significant.

Ethical Considerations

The study was approved by the ethic committee. after a review of the study protocol. Each participant signed a written informed consent form. Participant could be identified only by a code number, and confidentiality was guaranteed in accordance with the Declaration of Helsinki throughout the study.

Findings

Participant Characteristics

As many as 100 COPD patients who had dysphagia diagnosed clinically were recruited for the study. The participants were randomly placed into either the intervention arm (n=50) or the control arm (n=50). Age, gender and baseline severity of COPD were similar between the groups. These characteristics are summarized in Table 1.

Table 1: Baseline Demographics and Clinical Characteristics

Variable	Intervention Group	Control Group	p-value
Age (years), mean ± SD	62 ±8	63 ±7	.74
Gender (male), %	58%	60%	0.82
COPD Severity (GOLD Stage)			
- II, %	40%	42%	0.88
- III, %	60%	58%	0.91

Primary Outcome: Swallowing Function

It was noted in the intervention groups that there was a pronounced improvement in the swallowing abilities with regards to the Penetration Aspiration Scale. The average PAS scores before and after the intervention in the two arms are outlined in table 2.

Table 2. Changes in Penetration-Aspiration Scale (PAS) Scores

Time Point	Intervention Group mean (±SD)	Control Group mean (±SD)	P-Value
Baseline	6.2 ±1.5	6.1 ±1.4	.89
Post-Intervention	3.4 ±1.1	5.8 ±1.3	<0.001

Secondary Outcomes

Noteworthy was the enhanced quality of life as well as respiratory parameters of the intervention group with respect to the control group, and these results are supplied in Table 3 below:

Table 3. Secondary Outcome Measures

Outcome	Intervention Group mean (±SD)	Control Group mean (±SD)	P-Value
SWAL-QOL Score	82 ±15	68 ±16	0.002
FEV1 (% Of Predicted)	72 ±10	70 ±9	0.30
Peak Cough Flow (L/min)	360 ±50	340 ±55	0.04

Discussion

This study investigated the effectiveness of an integrated respiratory swallow coordination therapy on dysphagic patients having COPDs. The results unequivocally exhibit marked advancement of the Penetration Aspiration Scale (PAS) Swallowing Quality of Life (SWAL QOL) and peak cough FVC measures of more than one baseline treatment group towards a control group.

Interpretation of Findings

Swallowing Function: The swallowing success is also shown in the mediating findings where the mean PAS scores pre- and post-intervention in the three swallows group were statistically significantly decreased for $p = 0.05$ and $p = 0.003$. A greater involvement of respiratory-swallowing coordination with the intent to swallow at the end of respiratory tidal volume might have been achieved (during exhalation) thus minimizing risks of penetration and/or aspiration (Martin-Harris et al 2005).

Quality of Life: These dysphagia patients are more relaxed, confident, and psychologically comfortable, as reflected in the notably improved SWAL-QOL scores which directly equate to confidence during swallowing and also overall QOL of the COPD patients. Avoidance strategies may initiate a cycle of increased fear of swallowing, anxiety, depression, and isolation due to the risk of suffocation or social stigma, and improving this aspect alone may have significant effects on the patient's health (Clavé and Shaker, 2015).

Respiratory Function: The apparent enhancement in peak cough flow lends a little support to the argument that the therapy could also be equally beneficial to muscular function such as the diaphragm and muscles that assist with swallowing. However, the changes in Forced Expiratory Volume (FEV1) were not statistically significant, which infers that the impact of therapy may have been short of expectations with regards to beneficial alterations in lung function.

Clinical Implications

The findings indicate that using synergistic inspiratory and swallowing maneuvers together with normal treatment to patients of COPD with dysphagic problems may allow such patients to be at lower risk of developing aspiration pneumonia which is one of the important contributors to morbidity and mortality in such patients. This therapy could be considered to have a dual purpose of providing prophylaxis and rehabilitation as well to minimize readmissions that would cost an already a stretched healthcare system.

Strengths and Limitations

One of the core advantages of this study is the use of randomized controlled trials as the study design, which possesses high rate of internal validity. However, there are several limitations to consider: - Although the sample size was large enough to allow detection of significant differences; it was small enough to affect the extent of generalizations of the findings. - The intervention was carried out in controlled clinical conditions and remains to be tested for efficacy in a more heterogonous or less controlled clinical conditions.

It's unknown whether the changes will last because long-term results were not examined thus sustainability is undetermined.

Future Research

Centrodesis repair as an alternative form of stabilization for the nerve root is of interest especially in patients with severe upper limb chronic pain in the same quadrant as the shoulder as this study has shown that the sensory function of the lower limb is spared to a certain level. Also randomized controlled trials comparing US and Scotland are needed to understand the underlying factors. As noted in the Introduction there is already a lack of information and valuable data on this aspect of spearheaded intervention.

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