

Anxiety, depression and swallowing disorders in patients with Parkinson's disease

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Abstract

Swallowing disturbances (SDs), anxiety and depression are commonly present in Parkinson's disease (PD) patients. We hypothesized that there is an association between the presence of SDs and the PD affective state. Sixty-nine PD patients were assessed for the presence of SDs by undergoing cognitive screening with the Mini Mental State Examination (MMSE), completing three inventories: a swallowing disturbance questionnaire (SDQ), the Spielberger manual for the trait anxiety and Beck depression inventories. All patients underwent clinical swallowing evaluations by a speech and language pathologist (SLP). Patients diagnosed with SDs were also assessed by fiberoptic endoscopic evaluation of swallowing (FEES) performed by an ENT and SLP. Thirty-eight patients experienced SDs, the other 31 did not. The clinical characteristics of the two groups were matched. Patients with SDs experienced increased anxiety and depression compared to patients without SDs. Comparisons between patients who scored in the two opposite ends of the anxiety and depression ranges demonstrated that the most anxious and depressed patients reported more swallowing difficulties (SDQ scores) compared with the least anxious and depressed ones. In addition, the most anxious patients had significantly increased disease severity and decreased MMSE scores compared with the least anxious patients. Disease severity was also increased in the most depressed patients compared with the least depressed ones. Advanced disease emerged as being associated with high anxiety levels and greater numbers of SDs. The contribution of anxiety or depression to the development or worsening of SDs and their role in treatment strategy warrant further investigation.

Keywords: Parkinson's disease, swallowing disturbances, depression, anxiety

1. Introduction

Dysphagia (swallowing disturbances, SDs) affects the most cardinal aspect of human functions, the ability to take in nourishment by eating and drinking.

Malnutrition, dehydration, weight loss, difficulties in handling oral medications and the high incidence of aspiration pneumonia as a cause of death attest to the clinical importance of this problem [1]. It is well recognized that swallowing problems are associated with distressing psychological responses, such as anxiety, shame, depression, embarrassment, fear, and reduced self-esteem [2]. Emotional factors are believed to cause disturbances of appetite and eating, swallowing and digestive functions [3]. These factors are frequently observed in patients with esophageal disorders [4], such as disturbances of esophageal motility. Globus hystericus, or the sensation of a lump in the throat, has also been associated with panic disorders and depression [3]. Alternatively, these symptoms can also elicit anxiety and fear of eating which might lead to depression and reduced quality of life [5-7].

Parkinson's disease (PD) is a neurodegenerative disease that affects 1.4% of the population over the age of 55 years and 4.3% of the population 85 years of age and older [8]. SDs comprise a common complication (up to 95%) of patients with PD and are considered to be the major cause of death [9]. In patients with PD, SDs affect all three stages of swallowing, oral, pharyngeal and esophageal [10-11].

Patients with PD develop behavioral characteristics which frequently complicate the disease picture. These traits are attributed to a number of factors, including disease processes, medication effects, and psychological reactions to the illness. Up to two-thirds of patients with PD have persistent affective disturbances, specifically, high levels of depression and anxiety [12]. The interrelationship between mood, behavior and swallowing disturbances has not been investigated in the PD

population. Although the traditional goal of swallowing therapy is the prevention of aspiration pneumonia, behavioral symptoms play an important role as well. We tested the hypothesis that the presence of dysphagia among patients with PD is associated with mood and behavioral disturbances. We sought to determine whether PD patients with SDs are more depressed and anxious than PD patients without SDs and if PD patients who score high on the anxiety [13] and depression [14] inventories report more frequent and severe SDs than those who do not.

2. Methods

The study group included 69 consecutive patients (50 males, 19 females, average age 67.06 ± 11.72 years) with PD according to the UK Brain Bank criteria [15] who were recruited from the Movement Disorders Unit (MDU) of the Tel-Aviv Sourasky Medical Center. All patients were referred to the speech and language pathologist (SLP) for a speech or swallowing evaluation.

The clinical stage of all patients was rated by the Hoehn and Yahr (H&Y) classification [16-17]: the mean score was 2.06 ± 1.05 , and the average duration of PD motor symptoms was 8.0 ± 6.1 years. Patients with Mini Mental State Examination (MMSE) [18] <24 were excluded from this study, and the average MMSE score of the study population was 27.9 ± 2.5 . Before responding to the swallowing questionnaire, all patients signed a consent form that was approved by the local ethics committee.

Three self-report inventories were filled in by the participants. These inventories included:

1. The trait anxiety inventory [13] in which a score of 32 ± 8 or higher considered to be anxious.

2. The Beck depression inventory [14] whose score is divided into 4 categories: 5-9 = normal, 10-18 = mild-to-moderate depression, 12-29 = moderate-to-severe depression, and 30-63 = severe depression.
3. The Swallowing Disturbance Questionnaire (SDQ) [19] for which a score of 11 or higher is correlated with the presence of swallowing problems and indicative that the patient should be referred for a complete swallowing evaluation. The questionnaire consists of five questions related to the oral phase of swallowing and 10 questions to the pharyngeal phase.

The patients underwent clinical swallowing evaluation performed by an SLP specialist in dysphagia and PD (Y.M.), who assessed the oral and pharyngeal phases. They were asked to eat applesauce (3 tablespoons of 5 cc each) and one cracker (3 bites), and to drink water (3 cc and 5cc from a tablespoon and 3 consecutive swallows from a cup) in their usual way. The SLP noted how the patient manipulated the food in the mouth, the oral transit time, and the presence of a swallowing reflex during the acts of eating and drinking. Signs of aspiration signs, such as coughing, choking, change in vocal quality, regurgitation of liquid/food via the nose and difficulty in breathing after swallowing, were also recorded. The clinical swallowing exam was graded as being pathological if there were signs of reduced swallowing function or of aspiration. Patients who demonstrated a reduced swallowing function during the clinical swallowing evaluation were referred for Fiberoptic Endoscopic Evaluation of Swallowing (FEES). The FEES was performed by an otolaryngologist and the same SLP. During the evaluation, a laryngoscope was passed through the nasal cavity after topical vasoconstrictor spray had been applied. The laryngoscope was then inserted in the nasopharynx, oropharynx, and supraglottic area to allow adequate visualization of the structures involved in

swallowing. The scope was positioned in the oropharynx for evaluation of the act of swallowing colored food and liquid. The FEES was graded as being pathological if at least one of three swallowing disorders were observed, i.e., food residues in the hypopharynx, penetration and aspiration.

The patients were classified into a group of those with SDs (group SW) and another group without SDs (group N-SW). All clinical swallowing evaluations were performed one to two hours after anti-parkinsonian medications were taken in order to ensure that the clinical assessment was performed during the "On" state.

Comparisons between the characteristics of the patients in the two groups were by the independent t-test, and the differences in their total SDQ scores by univariate logistic regression. A logistic regression model was used to predict the probability of occurrence of an event, based on certain variables as predictors of that event. Here, the dependent (predicted) variable was the group (SW versus N-SW) and the independent variables, one at a time, were the SDQ, anxiety and depression scores. The results of the models yielded the crude odds ratios (ORs), meaning the probability of a patient to be SW or N-SW. In order to account for the baseline variables, we applied multiple logistic regression models, using these variables as covariates. This was done even though the comparisons of the baseline variables showed no significant differences between the groups in terms of age, disease severity, disease duration, and mini-mental score. The above-mentioned covariates were added to each variable analyzed in the model. The results of the models yielded the adjusted ORs.

We then tested whether the most anxious and the most depressed patients were different from the least anxious and the least depressed patients in terms of their SDQ scores. Four patient subgroups emerged based on the scores in the

affective questionnaires, regardless of their group assignment: they were the 25% most anxious and least anxious (MaxAnx, MinAnx, respectively), and the 25% most depressed and least depressed (MaxDep, MinDep, respectively). We applied univariate logistic regression using the group as the dependent variable (MaxAnx versus MinAnx, and MaxDep versus MinDep). The independent variables were the SDQ score, disease severity, age, disease duration and MMSE score as covariates, to control for a possible influence of these factors on the SDQ comparisons. Finally, we tested the associations between the background variables and the swallowing measures with the anxiety and depression scores using Pearson correlations. Age, MMSE score, disease duration, disease severity, oral score, pharyngeal score, and total SDQ score were correlated with anxiety and depression scores. All statistical analyses were performed using SPSS software (version 11).

3. Results

Age, MMSE score, disease duration, and the severity of the disease were compared in order to evaluate the extent of homogeneity between the two patient groups. The differences between them were not significant (Table 1).

The SW and N-SW groups were compared both with and without accounting for the covariate variables pertaining to affective state (Table 2). The groups differed significantly in their oral, pharyngeal, and total SDQ scores (with crude or adjusted ORs). The patients who were clinically diagnosed as suffering from SDs also reported more disturbances than the patients not diagnosed as having SDs. The SW group also showed a trend towards higher anxiety and depression scores than the N-SW group (Table 2). The multiple logistic regression analysis that accounted for the non-significant differences between the background variables of the patient groups yielded the same results. As such, differences in any of the background

variables of the two groups would not serve to explain the differences that were found between them in either the swallowing or affective scores.

A comparison between patients who scored in the two opposite ends of the anxiety and depression ranges and the SDQ score was performed. The SDQ scores of MaxAnx versus MinAnx and of MaxDep versus MinDep were significant ($p < 0.002$; $p < 0.021$, respectively). Specifically, the most anxious patients and the most depressed patients had higher SDQ scores compared to the least anxious and the least depressed ones. The background variables (age, duration, severity, and MMSE score) could not explain this difference since they were accounted for in the analysis (as covariates). In addition, significantly increased disease severity and decreased MMSE scores were found in the MaxAnx compared with MinAnx (OR=4.035, $p < 0.016$ and OR=0.679, $p < 0.047$, respectively). Disease severity was also increased in MaxDep compared with MinDep (OR=2.143, $p < 0.045$). Thus, prolonged disease severity emerged as being related to high anxiety levels and to increased SDQ scores.

Analysis of the association between the patients' complaints of SDs (oral, pharyngeal and SDQ scores) and the levels of anxiety and depression revealed a significant positive correlation between the SDQ total score and anxiety and depression ($r = 0.472$ $p < 0.000$ and $r = 0.357$ $p < 0.003$, respectively). There was also a significant positive correlation between the pharyngeal and the anxiety and depression scores ($r = 0.464$ $p < 0.000$ and $r = 0.316$ $p < 0.008$, respectively). Finally, the oral score correlated significantly and positively with the levels of anxiety ($r = 0.409$ $p < 0.015$). There was also a significant positive correlation between H&Y levels and the anxiety and depression levels ($r = 0.475$ $p < 0.000$ and $r = 0.481$ $p < 0.000$, respectively) (Table 3).

4. Discussion

This study characterized the level of depression and anxiety in two groups of patients with PD, one group that exhibited swallowing problems and another that did not. Comparisons between patients who scored in the two opposite ends of the anxiety and depression ranges demonstrated that the most anxious patients and the most depressed patients reported more SDs (SDQ scores) compared to the least anxious and the least depressed ones. It seemed that as PD patients became more anxious and depressed, they were more likely to complain about SDs.

It should be emphasized that the anxiety score in both groups was >32 , which is considered as being a high anxiety state. In contrast, the level of depression in both groups fell in the mild-to-moderate category.

High levels of anxiety and depression may serve as positive indicators to differentially diagnose the psychogenic dysphagia patient [20]. The role of psychological dysfunction as a possible contributing factor to the sensation of dysphagia in patients who have no demonstrable structural or motor abnormalities in the esophagus has been investigated [21]. This study suggested that patients with non-obstructive and non-motility dysphagia, as a group, have psychological characteristics that are similar to those found in patients with obstructive and motility dysphagia. However, our study demonstrates that patients with SDs experienced increased anxiety and depression compared to patients without SDs.

Although affective disturbances and dysphagia occur frequently in patients with PD and more so in those who have reached the advanced stage of the disease, it is curious that no attention has apparently been given to the association between these symptoms. The data on affective characteristics taken together with findings of

swallowing pathology could be useful in matching the most appropriate treatment to a given PD patient with SDs. It might be beneficial to identify the PD patients with SDs who are also depressed or anxious to a greater or lesser degree and decided upon the most optimal SLP intervention for treating and improving their affective state. The effect of swallowing difficulties on the development of anxiety and depression in patients with PD is unknown. The contribution of these SDs to already existing affective symptoms is very difficult to measure. Our current study raises the question about the association between SDs and affective states (depression and anxiety).

Our findings demonstrated that the motor disturbances (dysphagia) and the non-motor features (anxiety and depression) in PD worsen as the disease progresses. Thus, prolonged disease severity was related to increased anxiety and depression as well as to an increased likelihood of developing SDs. Although we could demonstrate associations between the two, we were unable to address the issue of causality. Anxiety and depression can worsen the swallowing process partially through their negative effect on the executive functions. Baudic et al [22] recently demonstrated that the severity of depression is associated with executive deficits [22]. Dysphagia can, however, increase anxiety and, to a lesser extent, depression through the awareness system, i.e., the recognition of the loss of a very fundamental motor function and its possible consequences, including death. Solutions to this complex equation await a prospective study that will objectively monitor both the affective state and the swallowing function. We recognize that depression and anxiety are almost inevitable in patients with progressive chronic diseases. The present study is the first to observe the significance of the

interrelationship between affective characteristics of PD and SDs: we hope it will motivate such a prospective study.

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Table 1. Clinical characteristics of the PD patients with swallowing disturbances (group SW) and the PD patients without swallowing disturbances (group N-SW)

| | SW group (<i>n</i> = 38) | N-SW group (<i>n</i> = 31) | <i>p</i> -value |
|------------------------|------------------------------|--------------------------------|-----------------|
| | Mean SD | Mean SD | |
| Age (years) | 69.1 ± 10.1 | 64.5 ± 13.2 | 0.109 |
| MMSE | 27.8 ± 2.7 | 28.1 ± 2.3 | 0.718 |
| Disease duration | 8.5 ± 6.1 | 7.5 ± 6.1 | 0.503 |
| Disease severity (H&Y) | 2.3 ± 1.2 | 1.8 ± 1.0 | 0.075 |

MMSE = Mini Mental State Examination, H&Y = Hoehn and Yahr, SD=Standard

Deviation.

Table 2. Swallowing and affective scores (mean±standard deviation SD) comparisons between PD patients with swallowing disturbances (SW) and PD patients without swallowing disturbances (N-SW); crude and adjusted ORs (95% CI).

| Variable | SW group (<i>n</i> = 38) Mean SD | N-SW group (<i>n</i> = 31) Mean SD | Crude OR (95% CI) | <i>p</i> -value | Adjusted OR (95% CI) | <i>p</i> -value |
|--------------------------------|--|--|-------------------------|-----------------|----------------------------|-----------------|
| Oral score | 4.4 ± 2.5 | 2.2 ± 4.2 | .782 | .013 | .802 | .042 |
| Pharyngeal score | 9.8 ± 4.9 | 2.8 ± 3.7 | .678 | .000 | .685 | .000 |
| SDQ | 14.2 ± 1.1 | 4.1 ± .94 | .769 | .000 | .768 | .000 |
| Trait anxiety (Spielberger) | 46.9 ± 11.3 | 38.7 ± 10.3 | .929 | .060 | .944 | .060 |
| Depression (Beck) | 14.8 ± 8.7 | 10.3 ± 9.3 | .940 | .053 | .942 | .166 |

SW group = patients with swallowing disturbances, N-SW = patients without swallowing disturbances, SDQ = swallowing disturbances questionnaire, SD=Standard Deviation.

Table 3. Pearson correlations between background characteristics and swallowing scores with the degree of anxiety and depression in the PD patients.

| | Anxiety | Depression |
|---------------------------|---------------------------|---------------------------|
| Age | $r = .166$ | $r = .188$ |
| MMSE | $p < .176$ $r = -.310$ | $p < .121$ $r = -.226$ |
| Disease duration | $p < .011$ $r = .057$ | $p < .066$ $r = .031$ |
| Severity of disease (H&Y) | $p < .644$ $r = .475$ | $p < .801$ $r = .481$ |
| Total SDQ | $p < .000$ $r = .472$ | $p < .000$ $r = .357$ |
| Oral score | $p < .000$ $r = .409$ | $p < .003$ $r = .118$ |
| Pharyngeal score | $p < .015$ $r = .464$ | $p < .493$ $r = .316$ |
| | $p < .000$ | $p < .008$ |

MMSE = Mini Mental State Examination, H&Y = Hoehn and Yahr,

SDQ = swallowing disturbances questionnaire.