
Dysphagia in Ambulant Patients with Parkinson's Disease: common, not dangerous

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Abstract: To assess the frequency of subjective and objective dysphagia and its possible pulmonary sequelae, we prospectively studied 22 out-patients with Parkinson's disease; 15 spouses served as controls. All subjects answered a standard questionnaire concerning swallowing and respiratory functions and underwent barium swallow videofluoroscopy. Possible pulmonary infection was investigated by recordings of body temperature, ESR, leucocyte count, and chest X-ray. Patients had significantly more symptoms than controls, especially choking, piece-meal deglutition and regurgitation. Videofluoroscopy revealed tracheal aspiration in one patient, vestibular aspiration in one patient and in one control. Non-fluent swallowing movements were common in patients: abnormal bolus formation, delayed swallowing reflex, vallecular stasis, and piriform sinus residue. None of the subjects had signs of pulmonary infection. Both subjective and objective oro-pharyngeal dysfunction is frequent in ambulant Parkinson patients, but apparently does not produce demonstrable pulmonary infection.

Résumé: La dysphagie chez les patients ambulants qui sont atteints de la maladie de parkinson: une manifestation fréquente, non dangereuse. Nous avons étudié de façon prospective 22 patients externes atteints de la maladie de Parkinson et 15 conjoints(es) servant de contrôles afin d'évaluer la fréquence de la dysphagie subjective et objective et de ses séquelles pulmonaires possibles. Tous les sujets ont répondu à un questionnaire standard concernant les fonctions de la déglutition et de la respiration et ont subi une évaluation de la déglutition par vidéofluoroscopie. La possibilité qu'il existe chez les patients une infection pulmonaire a été étudiée par l'enregistrement de la température corporelle, la vitesse de sédimentation globulaire, le décompte leucocytaire et la radiographie pulmonaire. Les patients avaient significativement plus de symptômes que les contrôles, particulièrement des étouffements, de la déglutition pièce à pièce et de la reégurgitation. La vidéofluoroscopie a révélé de l'aspiration trachéale chez un patient et de l'aspiration vestibulaire chez un patient et un contrôle. Les mouvements de déglutition discordants étaient fréquents chez les patients: formation anormale du bolus, retard du réflexe de déglutition, stase au niveau de la fossette glosso-épiglottique et présence d'un résidu au niveau du sinus piriforme. Aucun des sujets n'avait de signe d'infection pulmonaire. La dysfonction oropharyngée subjective et objective est fréquente chez les patients ambulants atteints de la maladie de Parkinson, mais elle ne semble pas induire d'infections pulmonaires qu'on peut objectiver.

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The frequency of subjective and objective dysphagia in Parkinson's disease (PD) is imprecisely known, reported rates varying from 0 to 100%, probably depending on patient selection and methods of assessment used.¹⁻⁴

It seems logical that the frequency and severity of signs and symptoms of abnormal swallowing are related to the stage of the disease, observer's bias, the viscosity of the (opaque) fluid and the criteria of abnormality.

The sequelae of eventual aspiration are not clear. Although "pneumonia" is a leading cause of death in patients with PD,⁵ it is surprising that patients may apparently aspirate liquids and food for several years without unequivocal signs of pulmonary involvement.

Therefore, we have studied the occurrence of dysphagia in a very well described group of PD patients. All patients answered a questionnaire and underwent swallow videofluoroscopy. Special attention was given to aspiration and its possible pulmonary consequences.

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SUBJECTS AND METHODS

Subjects

Twenty-two out-patients with idiopathic Parkinson's disease, 17 men and 5 women [mean (SD) age, 62.7 (9.9) years] were recruited. They were in modified Hoehn and Yahr⁶ stage 1.5 (n = 4), 2 (n = 7), 2.5 (n = 5), 3 (n = 3) or 4 (n = 3); their mean (SD, range) UPDRS⁶ rating was 31 (17, 14-86), whereas their mean duration of illness was 6.7 (3.7, 3-18) years. Hoehn and Yahr and UPDRS-ratings were assessed a maximum of 4 weeks before the videofluoroscopy. Patients with dementia (Mini-Mental State < 24),⁷ apparent depression, stage 5 of Hoehn and Yahr, other neurological or internal disorders interfering with swallowing or pulmonary function were excluded.

Spouses of the patients were asked to serve as controls. They completed a small questionnaire concerning their general health. This group comprised 4 men and 11 women with a mean age of 63.0 (9.7) years.

Methods

All subjects participated in a multimodal examination using the following:

1) A standard questionnaire concerning subjective dysphagia and respiratory function (Table 1). 2) Plasma haemoglobin, sedimentation rate, total leucocytes and differential count, assessed on the day of the videofluoroscopy, served as indicators of pulmonary infection. 3) Recording of the sublingual morning temperature with a digital thermometer during seven days preceding the videofluoroscopy, also to detect possible pulmonary infection. 4) A barium swallow with videofluoroscopy to evaluate swallowing function. The subjects were seated upright with their heads in neutral position. Each subject successively swallowed 5 different volumes of barium-opaque fluid, viz. 3, 6, 9, and 12 ml, followed by a "dry swallow" (0 ml). Thus, the dry swallow was recorded after the pharynx had been contrast-coated. Videofluoroscopy and a 48 images/second videocounter-timer were used to record the movements of pharynx and cervical oesophagus in the lateral projection. Ten patients had

discontinued their anti-Parkinson medication on our request from midnight until examination at about 11 a.m., whereas the remaining 12 preferred to continue. All recordings were analyzed frame by frame. The following aspects of swallow were studied: bolus formation in the mouth, movement of the tongue, hesitations of the hyoid reflecting aborted swallowing movements, emptying of the mouth, movement of the soft palate, starting of the swallowing reflex, movement of the hyoid, peristalsis of the pharynx, vallecular stasis, piriform sinus residue and aspiration before, during and after swallowing. All recordings were rated using a protocol by one observer (LL), who was not blinded with respect to whether it concerned a patient or control, but who was not aware of symptoms or severity of the disease. In case of doubt a second opinion was requested from a different rater (JV) who was blinded with respect to the status of the subject. 5) A chest X-ray, taken after the barium swallow, to detect aspiration and possible pulmonary infection (patients only). 6) A krypton-ventilation scan was done in subjects with tracheal aspiration to detect lung areas with ventilation deficits.

The study was approved by the Medical Ethical Committee of the Leiden Academic Hospital. Informed consent was given by patients and spouses.

RESULTS

1. Symptoms of dysphagia, documented in 16 patients and 8 controls by questionnaire, were significantly more frequent in patients than in controls ($p = 0.04$; Mann-Whitney U) (Table 1). Patients tended to have a somewhat more variable set of symptoms, whereas choking and/or heartburn was the usual complaint in almost all symptomatic controls. In patients, choking (at least once a month), piece-meal deglutition and heartburn (at least once a month) were the main complaints. None of the subjects had experienced coughing after eating or drinking. Three patients had noticed nasal fluid regurgitation after drinking, whereas one patient experienced choking daily. Curiously enough, despite the high rate of dysphagia as indicated by the questionnaire, only one patient had spontaneously forwarded swallowing difficulties.

2. None of the bloodsamples and temperature-charts from patients and controls indicated pulmonary infection, nor did the chest X-ray.

Table 1. Standard questionnaire on swallowing and respiratory function.

Swallowing function:

1. Do you choke sometimes? If so, how often?
2. Do you often have to cough after eating? If so, how often?
3. Do you often have to cough after drinking? If so, how often?
4. Did you have to cough often after eating or drinking at some time before? If so, at what time?
5. Does food sometimes get stuck in your throat? If so, how often?
6. Do you sometimes have to swallow several times in order to get rid of the same piece of food?
7. Does fluid sometimes emerge from the nose after drinking? If so, how often?
8. Do you sometimes suffer from heartburn? If so, how often?
9. Do you usually mince your food?

Respiratory function:

10. Are you short of breath?
11. Do you cough often?
12. Do you bring up mucus?
13. Do you smoke? (if so, how much)

Table 2. Results of the barium swallow.*

	Patients n = 22	Controls n = 15
Abnormal bolus formation	8 (36%)	3 (20%)
Lingual hesitancy	5 (23%)	2 (13%)
Hesitations of the hyoid	12 (55%)	7 (47%)
Piece-meal deglutition	4 (18%)	0 (0%)
Non-closure of the nasopharynx	5 (23%)	1 (7%)
Delayed swallowing reflex	7 (32%)	1 (7%)
Decreased pharyngeal peristalsis	5 (23%)	1 (7%)
Vallecular stasis	10 (45%)	3 (20%)
Piriform sinus residue	9 (41%)	2 (13%)
Vestibular aspiration	1 (5%)	1 (7%)
Tracheal aspiration	1 (5%)	0 (0%)

* Differences between frequencies of the individual aspects of swallowing for patients and controls are not significant (Fisher's 2x2 exact).

Table 3. Patient characteristics.

No.	Symptoms	Signs ¹
1.	–	HH (6 times)
2.	choking (2*/wk)	ABF; LH; HH (1 time); DSR; RPP; VS; PSR
3.	choking (1*/2 wks.)	HH (4 times); VS; PSR
4.	choking (1*/mth.)	ABF; HH (2 times); NCN; DSR; VS; PSR
5.	choking (5*/wk.); heartburn (3*/mth.)	–
6.	choking (2*/wk.); heartburn (1*/mth.); food sticks in throat; nasal fluid regurgitation	ABF; HH (1 time); VS; PSR
7.	choking (1*/mth.); more swallows to get rid of food	ABF; LH; NCN
8.	heartburn (1*/mth.)	–
9.	choking (1*/day); more swallows to get rid of food	HH (2 times); PMD
10.	choking (2*/wk.); heartburn (1*/mth.)	ABF; NCN; DSR; RPP; VS; PSR
11.	–	HH (7 times); VS; PSR; VA; TA (< 10% of liquid)
12.	choking (1*/mth.); more swallows to get rid of food	ABF; LH; HH (5 times); NCN; VS; PSR
13.	choking (3*/wk.); nasal fluid regurgitation	LH; PMD; DSR; DPP; VS; PSR; VA
14.	–	HH (1 time)
15.	–	–
16.	heartburn (daily)	ABF
17.	–	ABF; LH; HH (22 times); NCN; PMD; DSR; RPP; VS
18.	–	–
19.	food sticks in throat; more swallows to get rid of food; heartburn (daily)	HH (3 times); DSR
20.	choking (1*/mth.); heartburn (4*/wk.); food sticks in throat; more swallows to get rid of food	PMD
21.	heartburn (1*/wk.)	HH (3 times); DSR; DPP
22.	choking (2*/wk.); food sticks in throat; more swallows to get rid of food; nasal fluid regurgitation; heartburn (3*/mth.)	VS; PSR

¹ABF abnormal bolus formation; LH lingual hesitancy; HH hesitation of the hyoid; PMD piece-meal deglutition; NCN non closure of the nasopharynx; DSR delayed swallowing reflex; DPP decreased pharyngeal peristalsis; VS vallecular stasis; PSR piriform sinus residue; VA vestibular aspiration; TA tracheal aspiration.

3. Videofluoroscopically, many patients and several controls displayed non-fluent swallowing movements. Most frequent in patients were abnormal bolus formation, a delayed swallowing reflex (implying onset of the swallowing reflex after the bolus had passed the faucial isthmus) and vallecular and piriform sinus residue (Table 2). Similar non-fluencies, except delayed swallowing reflex, were seen in controls, however. Hesitations of the hyoid were seen in 12 patients and in 7 controls. A total number of 57 hyoid hesitations were counted in patients and 11 in controls. The number of hesitations per bolus could be as high as 6 for patients as compared with 2 for controls. Hesitations in PD occurred at all bolus volumes, whereas in controls hesitations were restricted to "dry swallows".

Signs of dysphagia, defined as videofluoroscopic non-fluency, were seen in 18 patients and 9 controls (Table 3). The frequency of non-fluency features differed significantly between patients and controls ($p = 0.04$, Mann-Whitney U). When one disregards hesitations, because they were relatively frequent in controls, these figures are 16 vs. 5 ($p = 0.02$). Although 16 patients and 8 controls also had symptoms of dysphagia, these did not correspond with the signs of non-fluency on videofluoroscopy. Hoehn and Yahr scales, duration of illness, and sex were not related to the number of signs, including the number of hesitations. The number of signs and hesitations did not differ in patients who had discontinued their medication and those who had not. The UPDRS ratings however, correlated significantly with the number of signs ($p < 0.05$).

One patient had difficulty emptying the pharynx after the bolus had been propelled into it, and needed several swallows to do so.

Aspiration was seen in two patients, one with vestibular aspiration, i.e., no barium below the true vocal folds, and one with tracheal aspiration of less than 10% of the liquid, both during swallowing. Vestibular aspiration in combination with vallecular stasis occurred in an 80-year-old female control, also during swallowing. None of these subjects had noticed the aspiration nor responded with a cough reflex.

4. In the one patient with tracheal aspiration a Krypton-ventilation scan was performed, but no ventilation deficit was seen.

DISCUSSION

The patients included were ambulant and had Parkinson's disease of moderate severity. Although in the patient group males largely outnumbered females for no apparent reason, no obvious difference was found in the rate of dysphagia between Parkinson patients of both sexes. Therefore, and because a sex difference in this respect has never been suggested in the literature, it is unlikely that sex differences account for the high frequency of dysphagia in PD in this study.

Subjective dysphagia was experienced by 16/22 and objective dysphagia in 18/22 patients. Subjective experiences and objective findings did not correspond in this study. Aspiration was found in only 1 patient without subjective dysphagia but signs of pulmonary infection were not found. Thus subjective as well as objective dysphagia were common in PD, but presumably did not result in pulmonary damage or infection, as neither the ESR, leucocyte counts, temperature charts, nor the chest X-rays or Krypton scan revealed a single indication in this direction. This is the more surprising, as no patient reported

having to cough after ingestion of fluid or food, despite frequent choking.

A number of recent, seemingly conflicting, studies have addressed the occurrence of swallowing disorders and dysphagia. Calne et al. did not find any cineradiographic swallowing abnormalities in 19 idiopathic PD patients and in 1 post-encephalitic patient, while 11 of these patients had complained of difficulty in eating.¹ Recordings were performed while patients were standing in erect posture, once while taking maximum doses of levodopa and once while taking a placebo. Exclusion criteria, average age of subjects, specific symptoms of the subjects, specific aspects of swallowing function which were assessed, and clinical ratings were not given. The authors comment that these patients might be generally much less severely disabled than those in a previous study of Silbiger et al.⁸ Robbins et al. performed a videofluoroscopic analysis in a group of 6 Parkinsonian and 6 age-matched controls; all patients were receiving levodopa at the time of testing.² The mean age of their patients was higher (69 years) than of ours, whereas their controls were younger (56 years). Exclusion criteria and the nature of their subjective dysphagia were not described. Two of their patients, both Hoehn and Yahr stage 5, "silently" aspirated liquid during and after a swallow.

Bushmann et al. evaluated swallowing function with videofluoroscopy in 20 PD patients with a somewhat higher average age.³ Patients had Hoehn and Yahr stages roughly similar to ours. They found a similar incidence of tracheal aspiration (3/20) and a much higher occurrence of vestibular aspiration (7/20).

Stroudley et al. examined 24 patients with PD and dysphagia referred to the dysphagia clinic, using videofluoroscopy; they had continued their levodopa medication.⁴ No less than ten patients had tracheal aspiration. Their patients were clinically

assessed by a neurologist and a ENT surgeon; exclusion criteria, average age of subjects, symptoms of the subjects and clinical ratings remained unspecified.

None of the latter three studies paid attention to the potential sequelae of tracheal aspiration observed. It might be assumed that the lack of clinically apparent pulmonary symptoms in these patients means that aspiration occurred without pulmonary complication. Of course, it is possible that in more advanced stages of the disease aspiration has serious effects, e.g., as a result both of higher frequency of aspiration and of inefficient coughing. This possibility will have to be investigated further.

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