

Sexual Dysfunction in Parkinson's Disease

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Sexual dysfunction is common in Parkinson's disease (PD). We investigated the premorbid and present sexual functioning of 75 people with PD (32 women and 43 men). Women reported difficulties with arousal (87.5%), with reaching orgasm (75.0%), with low sexual desire (46.9%), and with sexual dissatisfaction (37.5%). Men reported erectile dysfunction (68.4%), sexual dissatisfaction (65.1%), premature ejaculation (40.6%), and difficulties reaching orgasm (39.5%). Premorbid sexual dysfunction may contribute to cessation of sexual activity during the course of the disease (among 23.3% men and 21.9% women). Associated illnesses, use of medications, and advanced stage of PD contributed to sexual dysfunction.

Accumulating data from studies and clinical observations indicate that sexual dysfunction (SD) is common among patients with neurologic disorders, including Parkinson's disease (PD); (Basson, 1996; Brown, Jahanshahi, Quinn, & Marsden, 1990; Frohman, 2002; Jacobs, Vieregge, & Vieregge, 2000; Koller et al., 1990; Lipe, Longstreth, Bird, & Linde, 1990; Longstreth & Linde, 1984; Moore et al., 2002; Singer, Weiner, & Sanchez-Ramos, 1992; Uitti et al., 1989; Welch, Hung, & Waters, 1997; Wermuth & Stenager, 1995; Zesiewicz, Helal, & Hauser, 2000). SD represents one of the demoralizing and disabling features of PD (Frohman, 2002), decreasing both desire and function and resulting

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in reduced frequency of sexual activity (Koller et al., 1990). Arousal is affected for the majority of men (Koller et al., 1990), including young men with PD (Wermuth & Stenager, 1995). Depression, which is frequent among people with PD (Giladi et al., 2000; Noe Sebastian, Irimia Sieira, Pomares Arias, Martinez Vila, & Luquin Piudo, 2001), and significant physical disability are associated with reduced sexual function and sexual satisfaction (Jacobs et al., 2000; Lipe et al., 1990; Montejo, Llorca, Izquierdo, & Rico-Villademoros, 2001). Anti-Parkinsonian medications also may contribute to SD (Basson, 2001; Brown, Brown, Kofman, & Quarington, 1978; Koller et al., 1990; Korczyn, 1987; O'Sullivan & Hughes, 1998). Motor impairment such as rigidity, tremor, immobility in bed, or difficulty in fine finger movement may impair intimate touching needed for pleasuring and sexual arousal. Changed appearance, excessive sweating, drooling, and gait disturbances make patients less attractive. Similarly, masked faces can be interpreted as conveying a lack of affection and desire. The rigidity and bradykinesia cause patients to be sexually passive, thus imposing a more active role on the spouse. Sleep disturbances may lead to bed separation, thus decreasing opportunities for intimate contact (Basson, 2001; Brown et al., 1978; Koller et al., 1990; O'Sullivan & Hughes, 1998; Welch et al., 1997). Traditionally, practicing neurologists have not paid much attention to SD in their patients and many are reluctant to address these intimate issues (Bronner, 2001; Bronner, Royter, Korczyn, & Giladi, 2003; Frohman, 2002; Kalayjian & Morrell, 2000; Lundberg, Ertekin, Ghezzi, Swash, & Vodusek, 2001). However, the availability of treatments for many of these factors, particularly development of effective treatments for erectile dysfunction, provide powerful justification for a comprehensive assessment of sexual functioning (Frohman, 2002).

PURPOSE

This study attempts to investigate the present and premorbid sexual functioning of patients with PD. Because sexual counseling and therapy is an effective way to avoid further deterioration of the quality of sexual life, understanding the natural history of SD along the course of the disease and the risk factors for its development may be helpful for the patients and their partners as well as the treating physicians for early and more-effective intervention.

MATERIAL AND METHODS

Subjects

Data for this study were collected from consecutive patients with PD who fulfilled the U.K. brain bank criteria (Hughes, Daniel, Kilford, & Lees, 1992) in the Movement Disorders Unit at the Tel-Aviv Souraski Medical Center. We approached 101 nondemented (Mini-Mental State Examination

(Folstein, Folstein, & McHugh, 1975) (MMSE) > 25) PD patients, of whom 75 (32 women and 43 men) agreed to participate in this study and complete a questionnaire (77% response rate).

Questionnaires

Each subject was seated alone and completed a demographic and sexual function questionnaire. We assessed sexual function with the Israeli Sexual Behavior Inventory (ISBI; Kravetz, Drory, & Shaked, 1999), a 35-item questionnaire primarily designed to assess the impact of chronic illness and disability on sexual functioning and experience. We calculated scores for eight subscales, three of which measured components of healthy sexual behavior: sexual satisfaction, intimacy, and sexual drive. A fourth scale, health perception, refers to the degree to which poor health interferes with sexual functioning. The other scales, two for women and two for men, represent gender-related SD. The anorgasmia/avoidance scale (referred to as anorgasmia) and the vaginismus/dyspareunia scale (referred to as painful sex) describe female sexual problems, whereas the erectile dysfunction (ED) and premature ejaculation (PE) scales pertain to male sexual behavior. Higher scores indicate a more severe sexual impairment. Participants answered each question twice: First, evaluating their sexual function over the past 6 months and, second, retrospectively evaluating their general sexual function before the appearance of the first PD symptoms. We assessed depression using the Hamilton depression rating scale; we considered patients with a score ≥ 16 to be depressed (Hamilton, 1960). We evaluated cognitive state with the Mini Mental State Examination (Folstein, Folstein, McHugh, 1975); we considered dementia to be present when the score was 25 or below. We obtained data about stage of PD (Hoehn & Yahr, 1967), duration of the disease, present pharmacological treatment, and associated illnesses by clinical examination at the same visit and from medical records.

STATISTICAL ANALYSIS

On the basis of the responses to the ISBI questionnaire, we calculated a profile consisting of six scores for each respondent (Kravetz et al., 1999). We evaluated the effect of PD on sexual functioning as the relative difference between present score and the score regarding sexual function before the onset of PD symptoms. We assessed associations between present and past sexual functioning with demographic and clinical variables using Pearson correlation coefficients and student *t*-test, paired or unpaired as applicable. Regression was analyzed in two steps. First, we employed a best subset regression to identify explanatory variables for changes in each sexual function scale along the course of the disease. We used each variable (such as

associated illnesses, medications, and demographic variables) for this analysis. Then, we performed a stepwise regression with combined variables (associated diseases and medications, psychiatric diseases, and psychiatric medications). We finally constructed the explaining model forcing two variables (age and PD duration) until we reached a significance of $p < 0.1$ and a higher score of R^2 and adjusted R^2 . We used the SPSS for Windows version 10 and set statistical significance at the 0.05 level.

RESULTS

The study population is presented in Tables 1, 2 and 3. The average age of the subjects was 63.9 ± 11.3 (range 31–93) years, and 84.0% had a partner. Mean duration of PD symptoms was 8.9 ± 5.1 (range 2–23) years, and the mean Hoehn & Yahr (H&Y) staging at “off” was 2.5 ± 0.6 (range 1–4). Sixty seven patients (89.3%) were taking L-dopa and/or dopamine agonists. Ischemic heart disease (IHD) and hyperlipidemia were significantly more common among men.

Frequency of Sexual Problems in Men and Women with PD

The frequency of sexual problems during the past six months in men with PD is presented in Table 4. ED was the most-reported problem, followed by dissatisfaction with present sexual life, PE and difficulties reaching orgasm. Health was perceived by 31 men (72.1%) as a disturbing factor to their sexual life, and 18 men (41.9%) said that because of their health state, they sometimes refrained from sexual activity. Only 7 (16.3%) men were very satisfied with their present sexual life.

The most-frequent problem reported by women (Table 5) was difficulties getting aroused or reaching orgasm. About half of the women reported low sexual desire, and one third were dissatisfied with their sexual life. Health was perceived by 21 (65.7%) women as a disturbing factor to their sexual life, and 9 women (28.2%) said that because of their health state, they sometimes refrained from sex. Only 4 women (12.5%) were very satisfied with their sexual life.

TABLE 1. Gender-Based Clinical Characteristics of 75 Patients with Parkinson’s Disease

	Females ($n = 32$)	Males ($n = 43$)
Age (years, mean \pm SD, range)	61.6 ± 12.3 (31–76)	65.6 ± 10.3 (46–93)
Mean duration of PD symptoms (range/years)	8.0 ± 4.9 (2–23 years)	9.4 ± 5.3 (2–22)
H&Y staging at “off” (mean)	2.6 ± 0.5 (range II–III)	2.5 ± 0.6 (range I–IV)

PD = Parkinson’s disease; H&Y = Hoehn & Yahr.

TABLE 2. Concomitant Diseases in 75 Patients with Parkinson's Disease According to Gender

Concomitant disease	Females (<i>n</i> = 32)		Males (<i>n</i> = 43)		<i>P</i>
	No.	%	No.	%	
Depression (≥ 16 in HDRS)	13	40.6	13	30.2	NS ^a
Hypertension	8	25.0	11	25.6	NS ^a
Ischemic heart disease	5	15.6	18	41.9	.022 ^b
Diabetes mellitus	4	12.5	7	16.3	NS ^b
Hyperlipidemia	1	3.1	10	23.3	.019 ^b
Smoking	3	9.4	2	4.7	NS ^b
Post prostatectomy			2	4.7	

^a χ^2 ; ^bFisher exact test; HDRS = Hamilton test.

TABLE 3. Medications Used in 75 Patients with Parkinson's Disease According to Gender

Type of medication	Females (<i>n</i> = 32)		Males (<i>n</i> = 43)		<i>P</i>
	No.	%	No.	%	
L-dopa	25	78.1	36	85.7	NS ^a
Dopamine agonists	18	56.3	25	58.1	NS ^a
Neuroleptics	2	6.3	1	2.3	NS ²
Antidepressants	12	37.5	10	23.3	NS ^a
Beta blockers	6	18.8	4	9.3	NS ²

^a χ^2 ; ^bFisher exact test.

TABLE 4. Sexual Problems in Men with Parkinson's Disease

Type of sexual problem	No.	%
Erectile dysfunction	26/38	68.4
Dissatisfaction with sexual life	28/43	65.1
Premature ejaculation	13/32	40.6
Difficulties reaching orgasm	15/38	39.5
Difficulties ejaculating	9/33	27.3
Sexual desire (seldom/never)	10/43	23.3
Stopped having sex	10/43	23.3

Note. Numbers in denominator indicate the number of those who answered this item.

TABLE 5. Sexual Problems in Women with Parkinson's Disease

Type of sexual problem	No.	%
Difficulties getting aroused	21/24	87.5
Difficulties reaching orgasm	18/24	75.0
Sexual desire (seldom/never)	15/32	46.9
Dissatisfaction with sexual life	12/32	37.5
Stopped having sex	7/32	21.9
Dyspareunia (painful sex)	3/24	12.5

Note. Numbers in denominator indicate the number of those who answered this item.

In spite of the high frequency of SD, only 34.2% of the patients discussed sexual issues with their partners. Surprisingly, 70.6% of the patients reported that, generally, they were very satisfied with the quality of their dyadic relationship.

Cessation of Sexual Activity

Out of the study population ($n = 75$), 10 men (23.3%) and 7 women (21.9%) who were sexually active before the onset of Parkinsonism did not have sex at the time of this study. In general, the nonactive group was significantly older and had no partner (47% with no partner versus 6.9% in the sexually active group, $p = .03$). Nonactive men were at a more-advanced H&Y stage of the disease when compared to the sexually active group (3.0 ± 0.5 versus 2.4 ± 0.6 , $p = .02$).

Patients who were not active sexually at the time of the study scored significantly worse on the sexual desire and the intimacy scales prior to PD symptom onset ($p < .002$). Women who were not active sexually at the time of the study had lower sexual satisfaction ($p = .006$), had difficulties reaching orgasm ($p = .001$), and were more likely to have painful sex ($p = .004$) prior to PD symptoms onset compared with sexually active women.

The following variables were not associated with cessation of sexual activity during the course of PD: disease duration, smoking, hyperlipidemia, IHD, depression, diabetes, and use of medications (beta-blockers, neuroleptics, antidepressants, L-dopa, or dopamine agonists).

Changes in Sexual Functioning Along the Course of the Disease

A comparison of the sexual scores before the onset of PD symptoms and at the time of the study showed higher scores at present, implying a general deterioration in sexual functioning in 33 (76.7%) men and 25 (78.1%) women who were currently sexually active. In men, we observed a significant deterioration in all six sexual parameters of the ISBI. In women, there was a significant deterioration in five out of six ISBI sexual parameters (the exception being the painful-sex scale). Intimacy was the least affected item among women ($p = .05$).

Using stepwise regression, we found the following variables to explain the sexual changes in women: a decrease in desire was associated with a higher dose of L-dopa ($R^2 = 0.605$, $p = .004$) and with subjective perception of health deterioration ($R^2 = 0.605$, $p = .075$). Depression was associated with a decrease in intimacy ($R^2 = 0.358$, $p = .031$), and subjective perception of health deterioration was associated with a decrease in sexual satisfaction ($R^2 = 0.371$, $p = .055$).

In men, ED was associated with health factors ($R^2 = 0.753$), such as depression ($p = .024$), history of prostatectomy ($p = .002$), dopamine-agonist

use ($p = .007$), antidepressant use ($p = .014$), and a higher stage of H&Y ($p = .032$). PE ($R^2 = 0.494$) was correlated with depression ($p = .006$), antidepressant use ($p = .003$), presence of hyperlipidemia ($p = .01$), IHD ($p = .004$), and history of prostatectomy ($p = .013$). A decrease in sexual desire was moderately correlated with the use of dopamine agonists, but this result did not reach statistical significance ($R^2 = 0.461$ $p = .08$).

DISCUSSION

The main findings of this study were (a) men and women with PD reported SD in all six measured aspects and general dissatisfaction with their sexual life (65.1% men, 37.5% women); (b) premorbid low levels of desire, intimacy, and sexual satisfaction, as well as difficulties to reach orgasm and painful intercourse, may contribute to the cessation of sexual activity during the course of PD; (c) the decrease in sexual function could be partially explained by advanced stage of the disease or the use of dopaminergic drugs.

The results of this study emphasize the contribution of premorbid aspects of sexual life to the cessation of sexual activity during the course of PD. In other words, those with difficulties in their intimate life are prone to develop sexual disturbances during the course of the disease. In order to prevent further the deterioration in the sexual life of PD patients and their partners, we recommend that physicians discuss sexual issues with patients as early as possible. For example, adjacent to the diagnosis of PD, the neurologist can delicately inquire about the existence of SD. He then may suggest to refer the patient for an appropriate counseling (Basson, 1996; Bronner et al., 2003; Kalayjian & Morrell, 2000).

The high frequency of SD and dissatisfaction in this study is similar to that found in previous studies (Brown et al., 1978, 1990; Jacobs et al., 2000; Koller et al., 1990; Lipe et al., 1990; Moore et al., 2002; O'Sullivan & Hughes, 1998; Wermuth & Stenager, 1995). SD during course of PD has been explained by age and duration of the disease (Jacobs et al., 2000; Lipe et al., 1990). These factors therefore were forced into stepwise regression explanatory model. Our results demonstrated that medical factors such as associated diseases, use of medications, and H&Y staging of PD explained the sexual deterioration among Parkinsonian men, and use of L-dopa explained decrease in desire among Parkinsonian women.

There is evidence indicating that the central dopaminergic system has a major role in the control of sexual function and normal erectile activity both in animals and humans (Giuliano & Allard, 2001). Dopamine depletion in PD has been described in association with impairment of desire and arousal, and an increase in sexual desire was mentioned as an adverse reaction to dopaminergic drugs, although the incidence of such symptoms was rare (Basson, 1996; Courty, Durif, Zenut, Courty, & Lavarenne, 1997; Fernandez

& Durso, 1998; Hyppä, Rinne, & Sonninen, 1970; Korpelainen, Hiltunen, & Myllyla, 1998; Uitti et al., 1989). The heightened desire after a long period of undiagnosed stressful symptoms may confuse many patients about the levels of their premorbid and pretreatment sexual functioning (Basson, 1996).

Spontaneous erections and increased sexual interest were noted as side effects in patients treated with L-dopa or dopaminergic agents (Broderick & Foreman, 1994; Kanovsky, Bares, Pohanka, & Rektor, 2002), and recent studies describe apomorphine as an effective treatment for ED (Montorsi et al., 2003; Morales, 2001). However, we found a negative effect of L-dopa and dopamine agonists on desire and erectile function. These findings are compatible with previous anecdotal reports (Brown et al., 1978; Cleaves & Findley, 1987). Brown et al. (1978) reported that reduced sexual interest seemed to be related to L-dopa in 1 of 7 PD patients. Cleaves & Findley (1987) reported that impotence in four patients could be attributed to treatment with bromocriptine. We took into account the confounding effect of PD progression, depression, or antidepressants by applying the multiple linear regression and found that treatment with L-dopa and dopamine agonists had independent negative effect on erectile function and sexual desire. These findings raise the possibility of adverse effects of long-term dopaminergic treatment. Normal erectile function involves the autonomic system (Anderson, 2001). Autonomic function frequently is disturbed in PD and can be worsened by dopaminergic treatments, for example, gastric emptying time was slower because of L-dopa treatment (Hardoff et al., 2001; Korczyn, 1987). In addition, chronic dopaminergic treatment can cause orthostatic hypotension (Korczyn, 1990; Schoenberger, 1991). Thus, ED may be another autonomic disturbance associated with chronic dopaminergic treatment.

The decrease in desire reported by subjects in this study can be explained by changes imposed on patients because of the disease itself and its treatments (Basson, 2001; O'Sullivan & Hughes, 1998; Welch et al., 1997). The disease affects patients' self-esteem and sexual body image and can further contribute to the decrease in sexual desire. In addition, desire problems can emerge from frontal-lobe dysfunction in PD patients. Abnormalities at the prefrontal cortex and its subcortical connections frequently are associated with abulic syndrome, characterized by a lack of motivation and self initiation (Kulisevsky, 2000). The consequences of such a mental state on sexual desire are obvious, and low desire is not surprising.

In conclusion, the present study confirms previous reports concerning a high prevalence of SD and sexual dissatisfaction among Parkinsonian patients in a tertiary PD clinic. Those who had premorbid SD were prone to relinquish their sexual activity during the course of the disease. We suggest that dopaminergic treatment may induce ED and decrease sexual desire, but further investigation into this issue is needed.

One should take into account that our study has several limitations. First, the sample was not a random one. The subjects were recruited during their

visit in a tertiary PD clinic and may not properly represent the entire PD population. In addition, asking retrospectively about sexual function before the onset of PD may involve a recall bias. The use of self-report questionnaire to assess sexual dysfunction might be limiting; however Rosen and Beck (1988) claim that a self-report questionnaires may be an appropriate and valid tool when dealing with sensitive topics such as sexual behavior or sexual functioning. Validation of the results could be achieved by the use of objective parameters, such as asking the sexual partner or performing clinical evaluation of sexual function (e.g., erection). We asked partners of PD patients to answer the ISBI questionnaire, but most of them were reluctant to respond. Notwithstanding the limitations, it is obvious that PD patients and their partners suffer from considerable SD because of the combined effect of PD and its treatment and require special attention and sexual counseling.

REFERENCES

- Anderson, K. E. (2001). Neurophysiology/pharmacology of erection. *International Journal of Impotence Research*, 13(Suppl. 3), S8–S17.
- Basson, R. (1996). Sexuality and Parkinson's disease. *Parkinsonism and Related Disorders*, 2, 177–185.
- Basson, R. (2001). Sex and idiopathic Parkinson's disease. *Parkinson's disease. Advances in Neurology*, 86, 295–300.
- Broderick, G. A., & Foreman, M. M. (1994). Iatrogenic male sexual dysfunction: Drug induced and operative. In C. Singer & W. J. Weiner (Eds.), *Sexual dysfunction: A neuro-medical approach* (pp. 299–331). Armonk, NY: Futura.
- Bronner, G. (2001). Sexual health promotion—An inductive intervention model. *Harefuah*, 140, 72–76.
- Bronner, G., Royter, V., Korczyn, A. D., & Giladi, N. (2003). Sexuality and Parkinson's disease. In M. A. Bedard, Y. Agid, S. Chouinard, S. Fahn, A. D. Korczyn, & P. Lesperance (Eds.), *Mental and behavioral dysfunction in movement disorders* (pp. 517–526). New Jersey: Humana Press.
- Brown, E., Brown, G. M., Kofman, O., & Quarington, B. (1978). Sexual function and affect in parkinsonian men treated with L-Dopa. *American Journal of Psychiatry*, 135, 1552–1557.
- Brown, R. G., Jahanshahi, N., Quinn, N., & Marsden, C. D. (1990). Sexual function in patients with Parkinson's disease and their partners. *Journal of Neurology, Neurosurgery and Psychiatry*, 53, 480–486.
- Cleeves, L., & Findley, L. (1987). Bromocriptine induced impotence in Parkinson's disease. *British Medical Journal*, 295, 367–368.
- Courty, E., Durif, F., Zenut, M., Courty, P., & Lavarenne, J. (1997). Psychiatric and sexual disorders induced by apomorphine in Parkinson's disease. *Clinical Neuropharmacology*, 20, 140–147.
- Fernandez, H. H., & Durso, R. (1998). Clozapine for dopaminergic-induced paraphilias in Parkinson's disease. *Movement Disorders*, 13, 597–598.

- Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state": A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, *12*, 189–198.
- Frohman, E. M. (2002). Sexual dysfunction in neurologic disease. *Clinical Neuropharmacology*, *25*, 126–132.
- Giladi, N., Treves, T. A., Paleacu, D., Shabtai, H., Orlov, Y., Kandinov, B., Simon, E. S., & Korczyn, A. D. (2000). Risk factors for dementia, depression and psychosis in long-standing Parkinson's disease. *Journal of Neural Transmission*, *107*, 59–71.
- Giuliano, F., & Allard, J. (2001). Dopamine and sexual function. *International Journal of Impotence Research*, *13*(Suppl. 3), S18–S28.
- Hamilton, M. (1960). Hamilton Rating Scale for Depression (HRS-D): A rating scale for depression. *Journal of Neurology, Neurosurgery and Psychiatry*, *23*, 56.
- Hardoff, R., Sula, M., Tamir, A., Soil, A., Front, A., Badarna, S., Honigman, S., & Giladi, N. (2001). Gastric emptying time and gastric motility in patients with Parkinson's disease. *Movement Disorders*, *16*, 1041–1047.
- Hoehn, M. M., & Yahr, M. D. (1967). Parkinsonism: Onset, progression and mortality. *Neurology*, *17*, 427–442.
- Hughes, A. J., Daniel, S. E., Kilford, L., & Lees, A. J. (1992). Accuracy of clinical diagnosis of idiopathic Parkinson's disease: A clinico-pathological study of 100 cases. *Journal of Neurology, Neurosurgery and Psychiatry*, *55*, 181–184.
- Hyppä, M., Rinne, U. K., & Sonninen, V. (1970). The activating effect of L-Dopa treatment on sexual functions and its experimental background. *Acta Neurologica Scandinavica*, *46*, 223–224.
- Jacobs, H., Vieregge, A., & Vieregge, P. (2000). Sexuality in young patients with Parkinson's disease: A population based comparison with healthy controls. *Journal of Neurology, Neurosurgery and Psychiatry*, *69*, 550–552.
- Kalayjian, L. A., & Morrell, M. J. (2000). Female sexuality and neurological disease. *Journal of Sex Education and Therapy*, *25*, 89–95.
- Kanovsky, P., Bares, M., Pohanka, M., & Rektor, I. (2002). Penile erections and hypersexuality induced by pergolide treatment in advanced, fluctuating Parkinson's disease. *Journal of Neurology*, *249*, 112–114.
- Koller, W. C., Vetere-Overfield, B., Williamson, A., Busenbark, K., Nash, J., & Parrish, D. (1990). Sexual dysfunction in Parkinson's disease. *Clinical Neuropharmacology*, *13*, 461–463.
- Korczyn, A. D. (1987). Autonomic manifestations in Parkinson's disease. In G. Nappi & T. Caraceni (Eds.), *Handbook of Parkinson's disease: Morbo di Parkinson e Malattie Extrapiramidali* (pp. 205–210). Pavia, Edizioni Mediche Italiane.
- Korczyn, A. D. (1990). Cognitive dysfunction: The spectrum of parkinsonian syndromes. In E. C. Wolters, P. H. Scheltens, H. W. Berendse (Eds.), *Mental dysfunction in Parkinson's disease II* (pp. 209–214). Academic Pharmaceutical Productions, Utrecht, The Netherlands.
- Korpelainen, J. T., Hiltunen, P., & Myllyla, V. V. (1998). Moclobemide-induced hypersexuality in patients with stroke and Parkinson's disease. *Clinical Neuropharmacology*, *21*, 251–254.
- Kravetz, S., Drory, Y., & Shaked, A. (1999). The Israeli Sexual Behavior Inventory (ISBI): Scale construction and preliminary validation. *Sexuality & Disability*, *17*, 115–128.

- Kulisevsky, J. (2000). Role of dopamine in learning and memory. *Drugs & Aging, 16*, 365–379.
- Lipe, H., Longstreth, W. T., Bird, T. D., & Linde, M. (1990). Sexual function in married men with Parkinson's disease compared to married men with arthritis. *Neurology, 40*, 1347–1349.
- Longstreth, W. T., & Linde, M. (1984). Sickness impact profile in Parkinson's disease. *Neurology, 34*, 207–208.
- Lundberg, P. C., Ertekin, C., Ghezzi A., Swash, M., & Vodusek, D. (2001). Neurosexology—Guidelines for neurologists. *European Journal of Neurology, 8*(Suppl. 3), 2–24.
- Montejo, A. L., Llorca, G., Izquierdo, J. A., & Rico-Villademoros, F. (2001). Incidence of sexual dysfunction associated with antidepressants agents: A prospective multicenter study of 1022 outpatients. Spanish Working Group for the Study of Psychotropic-Related Sexual Dysfunction. *Journal of Clinical Psychiatry, 62*(Suppl. 3), 10–21.
- Montorsi, F., Salonia, A., Deho, F., Cestari, A., Guazzoni, G., Rigatti, P., & Stief, C. (2003). Pharmacological management of erectile dysfunction. *BJU International, 91*, 446–454.
- Moore, O., Gurevitch, T., Korczyn, A. D., Anca, M., Shabtai, H., & Giladi, N. (2002). Quality of sexual life in Parkinson's disease. *Parkinsonism and Related Disorders, 8*, 243–246.
- Morales, A. (2001). Apomorphine to Uprima: The development of a practical erectileogenic drug: A personal perspective. *International Journal of Impotence Research, 13*(Suppl. 3), S29–S34.
- Noe Sebastian, E., Irimia Sieira, P., Pomares Arias, E. M., Martinez Vila, E., & Luquin Piudo, M. R. (2001). Neuropsychiatric disorders in Parkinson's disease. *Revista de Neurologia, 32*, 676–681.
- O'Sullivan, J. D., & Hughes, A. J. (1998). Apomorphine-induced penile erection in Parkinson's disease. *Movement Disorders, 13*, 536–539.
- Rosen, R. C., & Beck, J. G. (1988). *Patterns of sexual arousal*. New York: Guilford.
- Schoenberger, J. A. (1991). Drug-induced orthostatic hypotension. *Drug Safety, 6*, 402–407.
- Singer, C., Weiner, W. J., & Sanchez-Ramos, J. (1992). Autonomic dysfunction in men with Parkinson's disease. *European Neurology, 32*, 134–140.
- Uitti, R. J., Tanner, C. M., Rajput, A. H., Goetz, C. G., Klawans, H. L., & Thiessen, B. (1989). Hypersexuality in antiparkinsonian therapy. *Clinical Neuropharmacology, 12*, 375–383.
- Welch, M., Hung, L., & Waters, C. H. (1997). Sexuality in women with Parkinson's disease. *Movement Disorders, 12*, 923–927.
- Wermuth, L., & Stenager, E. (1995). Sexual problems in young patients with Parkinson's disease. *Acta Neurologica Scandinavica, 91*, 453–455.
- Zesiewicz, T. A., Helal, M., & Hauser, M. D. (2000). Sildenafil citrate (Viagra) for the treatment of erectile dysfunction in men with Parkinson's disease. *Movement Disorders, 15*, 305–308.