Clinical Symptomatology and Speech impairments in Youth-onset Parkinson's Disease (YOPD) patients

Lambros Messinis, Ph.D[1]., George. P.Antoniadis, M.Sc[1,] Argyrios Biris, M.Sc [2]

[1] TEI Patras, School of Health Sciences, Department of Speech Therapy, Greece
[2] General Hospital of Larissa, Department of Psychology, Greece

ABSTRACT

Young or Youth – onset Parkinson's disease (YOPD) is characterized by disease onset before the age of 40 years. Two distinct subgroups are identified within this group: A young–youth Parkinson Disease (PD) group with age of disease onset between the ages of 21 years and 39 years and a juvenile group with age of disease onset in childhood or adolescence i.e. younger than 20 years. In contrast to (PD), patients with YOPD differ in several aspects regarding their clinical symptomatology and speech manifestations. Their presenting and predominant symptoms are rigidity and bradykinesia. They also frequently encounter focal dystonia (stiff muscles) either as an early manifestation or as a late development of the disease. Their speech is characterized by voice, articulation, resonance and prosodic impairments. Articulatory and prosodic impairments appear to be the most prominent. Compulsive repetitions of syllables (Pallilalia) and rate disorders are not frequently observed in YOPD patients in contrast to older PD patients. YOPD patients also respond to Levodopa extremely well, show more gradual progression of signs and symptoms as well as an earlier appearance of elodea – related dyskinesias and dose related motor fluctuation. Differential diagnosis of YOPD requires consideration / extensive investigation of other neurological conditions not generally seen in older PD patients i.e. Wilson's disease, or hepatolenticular degeneration, Spatz disease and Huntington's chorea.

1. INTRODUCTION

- Parkinson's Disease (PD) is a neurodegenerative movement disorder of the Central Nervous System (CNS)

- Pathophysiologically it is characterized by degeneration of cells in the substantia nigra one of the subcortical nuclei of the basal ganglia.

- Dysfunction of cells in substantia nigra leads to loss / deficiency of dopamine which in turn gives rise to the clinical picture of PD

- Although PD is considered an " old age" disease, approximately 10% are patients under age 40[32]

  - Young-onset Parkinson's disease (YOPD) is arbitrarily defined as Parkinson's Disease (PD) whose initial symptomatology is manifested before age 40 [1,2]

  - Two distinct subgroups are identified:
    - Young PD group with age of disease onset between 21-39 yrs, inclusive [2,5]
    - **Juvenile PD group, with disease onset in childhood or adolescence, onset age < 20yrs (uncommon – only few cases with neuropathologic confirmation have been reported) [1,2, 5,]

** These patients are not considered in this review

Ø Presenting / Predominant Clinical Symptomatology Of YOPD:

- Focal Dystonia ------- either as an early manifestation of the disease

  or

  ---------- late development of the disease
- Bradykinesia
- Tremor (initially presented in approximately 50% of YOPD patients)[6]
- Rigidity
- Gradual Progression of Parkinsonian signs and symptoms

Ø Speech impairments in YOPD patients:

- Hypokinetic dysarthria
  - Articulation (Changes in manner of articulation predominate over changes in place of articulation)
  - Prosody (Prominent in YOPD- impairment in the patterned distribution of stress intonation and other phonatory aspects of speech)
  - Voice (Voice hoarseness predominates., roughness, breathiness and tremulousness occur less)

Ø Psychological Symptoms

- Depression may be more common in YOPD[7]
- Dementia and cognitive impairments less common[6]
- Mental side effects of dopaminergic therapy are less common[2, 6]
- Anxiety is common after diagnosis of YOPD

2. DIFFERENTIAL DIAGNOSIS OF YOPD

- Laboratory investigations are more likely to be done in YOPD /Juvenile form, for the exclusion of metabolic, toxic and inherited conditions not generally seen in older PD patients
- The probability that another neurological disease is present increases at younger ages with the exception of idiopathic Parkinson
- Causes of secondary Parkinson should be excluded i.e. usage of neuroleptics or intake of toxic agents
- YOPD should be differentially diagnosed from the following diseases

1. **Wilson's disease**

   A disease of copper metabolism genetically inherited with mode of onset between 8-16 years, although can become symptomatic between 5-50 years [8]

   - Neurological symptoms are more common in males and include:

     - Dysarthria ----------predominant
     - Poor co-ordination -------predominant
     - Postural abnormalities
     - Dystonia
     - Chorea

- Full – Parkinsonian syndrome

  Course of disease 5-15 years

2. **Hallervoden-Spatz disease**
   Inherited, progressive degenerative disease, with onset in childhood
   Signs include:
   - Progressive muscle rigidity
   - Vision disturbances
   - Involuntary slow and twisting movement
   - Mental retardation

   - No effective treatment

   - Course of disease: Childhood to early 20's

3. **Huntington's chorea/ disease (HD)**

Genetically inherited disorder with onset of symptoms in the mid 30's – mid 40's

Initial manifestations include:

- Personality change followed by gradual emergence of chorea and cognitive impairment leading to dementia

In Juvenile HD (age of onset < 20 years)
- Resting tremor-------predominant
- Rigidity ----------predominant

Course of disease 10-30 years

3. DESCRIPTIVE EPIDEMIOLOGY

- PD Affects 0.4% of persons > 40 [9]
  1% > / = 65 [9]

- Prevalence of PD in North America and Western Europe is approximately 150 / 100.000 population [9,10,11,12]

- Incidence of the disease rises sharply at age 50 and increases throughout life [13,14]

- In persons 80-90 years old, prevalence rates among Europeans and North Americans reach between 1000-3000 cases/ 100.000 population [15]

- YOPD 4-12% of PD population[2,6]
    - Juvenile subgroups 6.7 – 23.3% of YOPD population[2,6]
    - In Japan Juvenile subgroup reach 33.5% of YOPD population[2,6]
    - Rural background in YOPD patients[2,6]

4. CLINICAL FEATURES AND DISEASE PROGRESSION OF YOPD

Ø Initial Symptoms

- Focal Dystonia presents as initial symptom in 9%-50% of YOPD patients [16, 17]
- For late onset PD focal dystonia presents as initial symptom in 0% - 4% of cases [18,19]
- Focal Dystonia is mainly observed in the lower limbs [20]

- Rigidity and Bradykinesia predominate the clinical pictures
- Gait impairments are rarely observed in YOPD (2.7% - 4%)[2,6]
- Comparatively gait disturbance is frequent in late onset PD (16% - 38%)[2,6]

- Rest tremors are less frequent in YOPD [2,20]
- 50% of YOPD patients have no tremor as initial symptom[6]
- 50% of YOPD patients have no tremor at all[6]

Ø Symptoms of disease progression

- YOPD progresses slower than PD[4,6]
- YOPD shows a relatively benign long-term progression
- Corrective reflexes are preserved in almost all patients for the first 10-20 years [4]
- The initial stage of the disease tends to last longer than in PD
- Disease progression related disabilities are less pronounced

Ø Therapeutic complications of L-dopa

- L-dopa has significant effects on symptoms in YOPD
- YOPD patients respond well to even small doses of L-Dopa (up to 90% of patients)[6]

But

L-Dopa related dyskinesias appear earlier than patients with the typical form of the disease

Show earlier signs of dose related motor fluctuations

- In study [21] L-dopa related dyskinesias and fluctuations in YOPD appear as early as 6 months into treatment

Table 1. Differences in Clinical features and Disease Progression between Young –onset PD and older –onset PD patients

	Older-onset PD - patients (age disease onset 60-64)	**Young – onset PD patients YOPD (age disease onset < 40)**
Age of onset	Over 60	Under 40 [2,6]
Dystonia	0% - 4% [18, 19]	9% - 50%[16]
Disease progression	Faster	Slower
Gait impairment	Frequent (16% - 38%)[2,6]	Very rare (2.7% - 4%)[2,6]
Complications of L-Dopa	Appear later	Dyskinesias appear earlier/ earlier signs of dose related Motor fluctuations
Depression	Possibly part of disease process	Probably due to everyday living activities (ELA)
Cognitive deficits	Recognized but do not progress as rapidly as the motor symptoms	Less commonly observed

1. SPEECH IMPAIRMENTS

In PD most patients (89%) have dysfunction of laryngeal function while almost half (45%) have articulatory problems [22]

In PD most patients have vocal tract problems. [23] Yet in YOPD most prominent are articulation and prosody disorders

Prosody impairments may also be due to dose related dyskinetic effects of levodopa [24]

The main speech difficulties that PD patients have are:

- Loss of volume, pitch, range and intonation of voice
- Rate of speech being either too fast or too slow
- Uncontrolled repetitions of sounds, words or phrases
- Slurred speech
- Difficulty initiating speech
- Harsh breathy voice

  - **WHY?**

- Rigidity and incomplete closure of the vocal cords during speech results in voice deficits [25]

Also

- Articulatory deficits are due to an underlying disease effect that modulates movement impairment across different functional motor systems [26]

  - **HYPO KINETIC DYSARTHRIA** is the term used for the articulatory deficits in PD

  The main symptoms are:

    - Overall loss of voice volume due to rigidity of the chest muscles
    - Difficulty changing voice volume i.e. inability to alter the voice volume in order to put stress and importance on key words or phrases
    - Hoarse or breathy voice
    - Difficulty changing the pitch of the voice in order to transmit meaning beyond the actual words spoken (prosody)
    - Difficulty controlling speaking rate which is due to bradykinesia
    - Imprecise pronunciation due to reduced strength, range and speed of tongue and lip movements.

- **Articulation in PD (most prominent)**

- Changes in manner of articulation predominate over changes in place of articulation [27]
- Heterogeneous articulatory gestures more difficult than homogeneous in PD group **(Less in YOPD)** [26]

- Stop-plosives, affricates and fricatives are most affected

Prosody in PD

- 20% of patients show a rate disorder – **Not so evident in YOPD** [27]

- 15% of patients exhibit palilalia - **Not evident in YOPD**

- 2% of patients show abnormally long pauses - **Not so evident in YOPD**

- Segmental and phrase level durations are slightly shorter in PD patients than corresponding durations in age-matched controls [28]

- Most prominent **prosodic impairment in YOPD** is observed in intonation i.e. listeners are unable to perceive changes in the fundamental frequency of vocal fold vibration that convey emotions to the message

Phonation (Voice)

- Vocal levels of pitch are more characteristic of older ages

- Variability is limited and voice is monotonous [29]

- Reduction of vocal intensity and monotony attribute to loss of amplitude and rigidity of chest musculature [30]

- Breathy vocal quality due to limited closure of the glottis in conjunction with a loss of synchrony between articulatory movement

Table 2. Differences in Speech impairments between Young –onset PD and older –onset PD patients

		Older-onset PD - patients (age disease onset 60-64)	Young – onset PD patients YOPD (age disease onset < 40)
PHONATION	Intensity Reduction	Higher	Lower
	Pitch Variation changes	Less prominent	More prominent
	Breathiness	Observed more	Observed less
ARTICULATION		Prominent	Predominant compared to other symptoms
RESONANCE PROBLEMS (HYPERNASALITY		Low incidence	Extremely low incidence
PROSODY	Rate Disorders	Prominent	Not equally prominent/observed in all patients
	Rhythm disturbance	Prominent	Predominant compared to other symptoms
	Intonation	Prominent	Predominant compared to other symptoms
	Intelligibility reduction	More common	Less common

2. PSYCHOLOGICAL SYMPTOMS

Ø Depression

- Diagnosing depression in PD and YOPD may be difficult as there is an overlap between Parkinson and depression symptoms e.g.
  - Weight loss
  - Sleep disturbance
  - Fatigue

- Depression can be differentially diagnosed in YOPD by looking for symptoms of:
  - Decreased concentration
  - Feelings of worthlessness

- Low self esteem
- Positive response to antidepressants (particularly SSRI's and Tricyclic antidepressants)

- The Percentage of depression symptoms in PD population is relatively high[31]

- The belief that depression is part of the disease process is reinforced as studies indicate that approximately 20% of people diagnosed with PD suffer from depression prior to being diagnosed with PD [7,31]

- Depression may occur more frequently and earlier in YOPD compared to older onset patients although no unanimous agreement exists across the spectrum of studies[7, 31]

- In YOPD depression was found to be related to cognitive problems yet it is more evident in relation to everyday living activities [7]

Ø Anxiety

- Anxiety symptoms often follow the diagnosis of PD this is also the case for YOPD patients

- The form of Anxiety is usually a generalized anxiety, panic disorder or social phobia

- Patients with anxiety also normally present with symptoms of depression [7]

Ø Personality Characteristics

- YOPD patients are not more prone than older onset PD patients to present with the Parkinson pre-morbid characteristics of conservatism and introversion.

7. Conclusions

Ø Youth – onset Parkinson's disease has clinical features that differentiate it from older onset PD patients. These are:

- Age of disease onset < 40
- Early manifestation of focal dystonia, especially in the lower limbs.
- Gradual progression of Parkinsonian signs and symptoms.
- Longer duration of initial stages.

- Earlier appearance of L-Dopa related dyskenisias / motor fluctuations.

- Rarely observed gait impairments.

Ø Differential diagnosis of YOPD requires investigation of other neurological conditions not generally seen in older PD patients i.e. Wilson's disease, Hallervoden-Spatz disease and Huntington's chorea

Ø Speech impairments most evident in YOPD include:

- Articulation problems
- Rhythm disturbances
- Intonation impairments

8. References

1. Quinn N, Critchley P, Marsden, CD. (1987) Young – onset Parkinson's disease. Movement Disorders, 2, 73-91

2. Golbe, L (1991). Young – onset Parkinson's disease: A clinical review, 41, 168-173

3. Gershanik O. (1988). Parkinsonism of early onset. In Jankovic, J & Tolosa, E 9 (eds). Parkinson's Disease and Movement Disorder, (pp.191-204). Baltimore: Urban and Swarzenburg.

4. Schrag A, Ben-Shlomo,Y, Brown R Marsden CD, Quinn, N. (1998). Young – onset Parkinson's disease revisited – clinical features, natural history, and mortality. Movement Disorders, 13, 885-894

5. O Sullivan JD, Hanagasi H, A, Daniel, SE, Tidswell, P, Davies, SW, Lees, AJ (2000). Neuronal intranuclear inclusion disease and juvenile Parkinsonism. Movement Disorders, 15 (5), 990-995

6. Bostanjopoulou, S & Katsarou, Z (2000). Young – onset Parkinson's disease. Encephalos, 37, 180-183

7. Kostic, S., (1998) Institute of Neurology CCS Belgrade – Yugoslavia. Seminar presentation at the 5th International Congress of Parkinson's disease and Movement Disorders, New York.

8. Pfeiffer, R.F. (1997) Wilson's disease. In R.L. Watts & W.C. Koller (Eds.), Movement disorders: Neurologic principles and practice (pp. 623-637). New York: McGraw – Hill.

9. Merck Manual of Diagnosis and Therapy (1999). Disorders of Movement. Section 14; Chapter 179:

10. Errea, J.M., Ara, J.R., Aibar, C., de Pedre-Cuesta, J., (1999). Prevalence of Parkinson's disease in lower Aragon, Spain. Movement Disorders, 14, 596-604.

11. Fall, P.A., Axelson, O., Fredriksson, M., Hansson, G., Lindvall, B., Olsson, J.E., Granerus, A.K., (1996). Age-standardized incidence and prevalence of Parkinson's disease in a Swedish community. Journal of Clinical Epidemiology, 49, 637-41.

12. Trenkwalder, C., Schwarrtz, J., Gebhard, J., Ruland, D., Trenkwalder, P., Hense, H.W., Oertel, W.H., (1995). Stanberg trial on epidemiology of parkinsonism and hypertension in the elderly. Prevalence of Parkinson's disease and related disorders assessed by a door-to-door survey of inhabitants older than 65 years. Archives of Neurology, 52(142),820-827.

13. Checkoway, H., & Nelson, L., (1999). Epidemiologic Approaches to the Study of Parkinson's disease Etiology. Epidemiology 10,327-336.

14. Bennett, D.A., Beckett, L.A., Murray, A.M., Shannon, K.M., Goetz, C.G., Pilgrim, D.M., Evans, D.A., (1996). Prevalence of parkinsonian signs and associated mortality in a community population of older people. New England Journal of Medicine, 334,71-76.

15. Tanner, C.M.,. and Ben-Shlomo, Y. (1999). Epidemiology of Parkinson's disease. Advances in Neurology. 80, 152-9

16. Muthane, U., Swamy, H., Satischchandra, P, et al., (1994). Early onset Parkinson's disease: are juvenile and young – onset different? Movement Disorder. 9, 539-544.

17. Gershanik, O., Leist, A., (1986). Juvenile onset Parkinson's disease. Advances in Neurology, 45,213-216.

18. Gibb, WRG, Lees, A., (1988). A comparison of clinical and pathological features of young and old onset Parkinson's disease. Neurology, 38,1402-1406.

19. Gomez Arevalo, G., Jorge, R., Garcia, S et al., (1997). Clinical and pharmacological differences in early – versus late – onset Parkinsons disease. Movement Disorders, 12, 277-284.

20. Gibb, W.R.G., Lees, A.J. (1988). A comparison of clinical and pathological features of young and old onset Parkinson's disease. Neurology, 38,1302-1406.

21. Kostic, Y., Przedborski, S, Flaster, E., Sternic N. (1991). Early development of levodopa – induced dyskinesias and response fluctuations in young – onset Parkinson's disease. Neurology, 41, 202-205.

22. Kompoliti, K., Wang, Q.E., Goetz, C.G., Leurgans, Raman, R. (2000). Effects of central dopaminergic stimulation by apromorphine on speech in Parkinson's disease. Neurology, 54,458.

23. Logemann, J.A., Fisher, H.B., Boshes, B., & Blonsky, E.R. (1978). Frequency and coocurrence of vocal tract dysfunction in the speech of a large sample of Parkinson patients. Journal of Speech and Hearing Disorders, 43, 47-57.

24. Critchley, E.M., (1981). Speech disorders of Parkinsonism: a review. Journal of Neurology, Neurosurgery, and Psychiatry, 44, 751-758.

25. Daniels, N,m Oates, J., Phyland, D et al. (1996). Vocal characteristics and response to levodopa in PD. Movement Disorders. 11, 117.

26. Ho, A.K., Brandshaw, J.L., Cunnington, R., Phillips, J.G., Iansek, R. (1998). Sequence Heterogeneity in Parkinsonian Speech. Brain and Language Academic Press. 64, (1) 122-145.

27. Logemann, J.A., & Fisher, H.B. (1981). Vocal tract control in Parkinson's disease: Phonetic feature analysis of misarticulations. Journal of Speech and Hearing Disorders, 46, 348-352.

28. Weismer, G. (1984). Articulatory characteristics of Parkinsonian dysarthria: Segmental and phrase level timing, spriantization, and glottal – supraglottal coordination. In M. McNeil, J. Rosenbek, and Aronson (Eds.), The dysarthrias: Psychology, acoustics, perception, and management. San Diego: College Hill Press.

29. Darley, F.L., Aronson, A.E., and Brown, J.R. (1975). Motor Speech Disorders. Saunders, Philadelphia.

30. Torre de la, R., Meyer, M., and Boshes, B. (1960. Studies in Parkinsonism, IX. Evaluation of respiratory function; Preliminary observation, Q. Bull. North - Western Med. School. 34, 332-336.

31. Fitzsimmons, B., Bunting, L. (1993). Parkinson's disease: Quality of life issues. Journal of Neuroscience Nursing 28, (4) 807-817

32. Reese, S (1999). Issues in caring for the patient with Young-onset Parkinson's disease. Home health care Consultant, 6 (4), 26-29