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Progressive Supranuclear Palsy 1979: an overview

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Since the articles of Olszewski et al [125], Richardson et al [142], and Steele et al [168] in 1963 and 1964, so many papers have been devoted to Progressive Supranuclear Palsy (PSP) that it would be interesting to know whether diagnostic standards have changed, and, if so, how. Patients of Steele et al [168] early presented with voluntary gaze defect mainly downward, rigid neck extension, and stiff face. Dysarthria and a more diffuse rigidity developed in the advanced course, while a mild mental deterioration was present from the very beginning. In 1975, Steele [167] was able to outline a more comprehensive picture of PSP (Table I) on the basis of 72 cases collected from the literature, and stated that ophthalmoplegia and nuchal rigidity could be considered as most distinctive features of the syndrome. Furthermore, from that review it became apparent that signs of supranuclear palsy slowly progressed into signs of nuclear palsy. The present review was based upon 75 cases with neuropathological examination (Table II) and 310 clinical cases (Table III) published during the last 17 years (1963-1979), and upon two cases prior to 1963 [25, 34]. Controversial cases [36, 156] and PSP-like conditions [22, 27, 116, 145] were excluded. The analysis of data allows the whole problem of PSP to be placed into proper perspective.

1. In anatomical case series, mean age at onset was 57 years (range 47-74) and death occurred at 65 (51-81) (Fig. 1), after a course duration of 5.8 (1-15) (Fig. 2). Males were affected more than females (2.5:1).

2. Symptoms at onset or within the first year were: unsteady gait with abrupt unexplained falls (68.9% of anatomical cases) and postural abnormalities in upright stance (50%), blurred vision (63.6%), mental deterioration including personality changes (52%), and dysarthria and/or dysphagia (40%) (Table IV, Fig. 3).

TABLE I - *Clinical findings in 72 cases of PSP* (Steele [167])

Sex ratio (M/F): 2.4:1.
Mean age at onset: 55 years (range 45-73).
Mean duration: 5.6 years (range 2-11).
Early complaints: Unsteady gait, abrupt falls, slowness, forgetfulness, blurred vision, altered speech, irascibility and other changes in personality.
Symptoms: Slowness and limitations of voluntary movements of the eyes in the vertical plane, especially upward, with normal reflex movements. Difficulty in shifting gaze. Absence of near reflex and progressive ocular immobility with subsequent staring gaze and astonished expression. Stiff face. Dysarthria. Dysphagia. Explosive coughing. Extended neck. Rigidity of the limbs and bradykinesia. Awkwardness and hesitancy of gait.
Evolution: Severe or complete ophthalmoplegia with involvement of reflex ocular movements. Severe bradykinesia. Rigid double hemiplegic posture with axial extension and brisk deep tendon reflexes.
Final: Akinetic state.

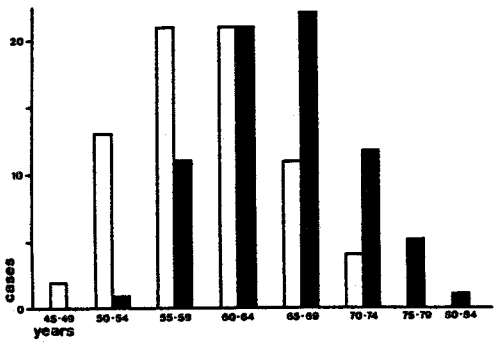

Fig. 1. *Frequency distribution of age at onset (white bars) and at death (black bars) of 72 and 73 patients, respectively, with histologically ascertained PSP.*

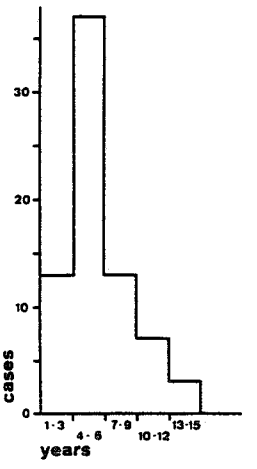

Fig. 2. *Mean duration of the disease in 72 patients with histologically ascertained PSP.*

TABLE II - *Cases of PSP with histological examination of the CNS**

Author and reference	Number of cases	Special field of investigation**	Cases reported previously
1963 Olszewski et al [125]	6	a b g	
Richardson et al [142]	6	a b g	Olszewski et al [125], six cases
1964 Steele et al [168]	7	a b g	Olszewski et al [125], Richardson et al [142], six cases
1967 Brusa et al [26]	1	a b g	
Weinmann [194]	1	a b	
1968 David et al [48]	2	a b	
1969 Anzil [12]	1	a b g	
Behrman et al [20]	4	a b g	
Blumenthal and Miller [23]	1	a b g	
Cambier et al [30]	1	a b g	
Rizzuto and Vio [144]	1	a b g	
1970 Constantinidis et al [37]	1	a b e g	
1971 Dix et al [53]	2	a b e	
Jellinger [78]	2	a b g	
1972 Antunes et al [11]	3	a b f	
Mannen et al [100]	1	a b	
Pfaffenbach et al [127]	2	a	
Rajput et al [138]	1	a b f	
Steele [166]	4	a b	Steele et al [168], two clinical cases

TABLE II - *cont'd*

Author and reference	Number of cases	Special field of investigation**	Cases reported previously
1973 Tellez-Nagel and Wisniewski [173]	1	a b c	
1974 Ishino et al [71]	1	a b	
Kurihara et al [94]	1	a b e	
Mano et al [101]	1	a b	
Morax et al [112]	1	a	
Powell et al [133]	2	a b c	
Rizzo [143]	1	a b e	
Rouzaud et al [146]	1	a b f	
Roy et al [148]	1	b c	
1975 Couet [41]	1	a b d e f g	Cambier et al [30]
Durand [55]	1	a b d e f g	Rouzaud et al [146]
Ishino et al [72]	2	a b	Ishino et al [71], one case
Ishino and Otsuki [73]	2	a b	Ishino et al [71, 72]
Kobayashi et al [93]	1	a b g	probably Iijima et al [69], as a clinical case
Picard and Richardson jr. [128]	1	a b c	
Probst and Dufresne [135]	8	a b	
1976 Ishino and Otsuki [74]	2	a b	Ishino et al [71, 72], Ishino and Otsuki [73]
Laurent [96]	3	a b c d e f	
Leygonie et al [98]	1	a e	
1977 Dalziel and Griffiths [47]	4	a b	
Kissel et al [89]	1	a b	Kissel et al [88], as a clinical case
Probst [134]	1	a b c	
Tomonaga [176]	1	b c	
1978 Agostini et al [1]	1	a b d	
Nyberg-Hansen and Holmsen [123]	1	a b e	
Schainker [152]	1	a b	
1979 Bugiani et al [28]	5	a b c	Brusa [25], Brusa et al [26], two cases
Ishii and Itoh [70]	1	a b c	
Khunadorn et al [86]	1	a b	
Yagishita et al [196]	1	a b c	

*Total is 22 more than the number of patients because there were several patients reported twice or more.

**a: clinical diagnosis
b: neuropathology
c: electronmicroscopy
d: pathophysiology
e: EEG, EMG, neuroradiologic procedures, high functions tests
f: biochemistry and pharmacology
g: nosography

TABLE III - *Cases of PSP without histological examination of the CNS**

	Author and reference	Number of cases	Special field of investigation**	Cases reported previously
1963	Olszewski et al [125]	2	a g	
	Richardson et al [142]	2	a g	Olszewski et al [125]
1964	Steele et al [168]	2	a g	Olszewski et al [125] and Richardson et al [142], one case
1965	Barbeau [16]	1	a e	
	Goldstein and Cogan [65]	1	a	
	Jequier and De Crousaz [81]	3	a g	
	Jequier and De Crousaz [82]	3	a g	Jequier and De Crousaz [81]
	Støier [169]	1	a	
1966	Anastasopoulos et al [7]	5	a	
	Messert and van Nuis [106]	3	a	
1967	Anastasopoulos et al [8]	7	a	Anastasopoulos et al [7], five cases
	Anastasopoulos et al [9]	1	a	
	Chateau et al [33]	1	a g	
	Ismaelides et al [75]	1	a	
	Kissel et al [87]	1	a e	
	Kissel et al [88]	2	a e	Kissel et al [87], one case
	Szulc-Kuberska [171]	1	a	
1968	Anastasopoulos et al [10]	1	a e g	
	David et al [48]	4	a	
	Ferri et al [58]	1	a g	
	Jandolo and Paolella [76]	1	a	
	Pollingher [130]	1	a	
1969	De Renzi and Vignolo [52]	2	a f	
	Gilbert and Feldman [62]	1	a f	
	Gross [66]	1	a f	
	Jenkins [80]	1	a f	
	Klawans jr [90]	1	f	
	Mironi et al [109]	1	a g	
	Sacks [149]	1	a f	
	Wagshull and Daroff [191]	2	a f	
	Wagshull and Daroff [192]	1	a f	Wagshull and Daroff [191]
	Walsh and Hoyt [193]	2	a e	
1970	Dehaene and Bogaerts [50]	1	a f	
	Mendell et al [105]	1	a f	
	Newman et al [122]	3	a e	
	Powell [132]	1	a	
	Samaras [150]	11	a d e f g	Anastasopoulos et al [7, 8, 9, 10], nine cases
	Sanders and Bird [151]	10	a	
	Scott [155]	1	a e	
	Steele [165]	1	a	
	Tridon and Weber [180]	1	a f	

TABLE III - *cont'd*

	Author and reference	Number of cases	Special field of investigation**	Cases reported previously
1971	Dehaene and Bogaerts [51]	1	a f	Dehaene and Bogaerts [50]
	Dix et al [53]	7	a d e	
	Iijima et al [69]	3	a e	
	Klawans jr. and Ringel [92]	3	a d f	Klawans jr. [90], one case
1972	Antunes et al [11]	6	a f	
	Balcells Riba et al [15]	1	a	
	Corin et al [39]	7	a g	
	Gimenez-Roldan and Esteban [63]	1	a e f g	
	Mrozek et al [113]	1	a	
	Mrozek et al [114]	1	a	Mrozek et al [113]
	Nagamatsu et al [115]	1	a	
	Pfaffenbach et al [127]	42	a	
	Schott et al [154]	2	d e f	
	Simonetti and Ferrarini [158]	1	a d g	
1973	Alvarez [6]	1	a	
	Curzon [45]	2	f	
	Donaldson [54]	2	a f	
	Klawans jr. [91]	2	d f	
	Mastaglia et al [102]	11	a e f	
	Miquel et al [108]	1	a e	
	Su and Goldensohn [170]	12	a e	Antunes et al [11], three anatomical cases, six clinical cases
1974	Albert et al [5]	5	a e	
	Bentson and Keesey [21]	6	a e	
	Chase [32]	3	d g	
	Craus [42]	?	a d e f g	
	Liaño and Gimeno [99]	1	a e	
	Morax et al [112]	6	a	
	Singh et al [160]	4	a f	
	Spissu and Orzalesi [163]	1	a f	
	Trávník [178]	1	a	
1975	Arnott et al [13]	1	a e	
	Arnott et al [14]	1	a e	Arnott et al [13]
	Couet [41]	9	a d e f g	
	Durand [55]	1	a d e f g	
	Kawamura et al [85]	1	a e	
	Mastaglia et al [103]	4	a	Mastaglia et al [102], three cases
	Probst and Dufresne [135]	6	a	
	Rouzaud et al [147]	2	a	Rouzaud et al [146] and Durand [55], one anatomical case
	Trevisan et al [179]	2	a e	
	Varela and Ferrer [186]	1	a	
	Velmurugendran et al [187]	6	a	

TABLE III - *cont'd*

Author and reference	Number of cases	Special field of investigation**	Cases reported previously
1976 Kase et al (84)	1	a e	
Laurent (96)	7	a d e f	
Leygonie et al (98)	2	a e	
Singh et al (159)	3	a f	
Wada et al (190)	1	a e g	
1977 Barontini and Pagnini (17)	6	e	
Rafal et al (136)	6	a f	
Schleider and Nagurney (153)	1	a	
Tashiro et al (172)	2	a e f	
Troost and Daroff (181)	8	e	
Umeda (182)	1	a e	
1978 Barontini et al (18)	1	a e	
Gross et al (67)	4	e	
Hall (68)	1	a f	
Nyberg-Hansen and Holmsen (123)	3	a e	
Perkin et al (126)	5	a e f	
Pinhas et al (129)	1	a e	
Umeda and Sakata (183)	1	a e	
1979 De Falco et al (49)	5	f	
Gimenez-Roldan et al (64)	2	a e f	
Jouvet and Perret (83)	8	e	
Laffont et al (95)	9	a e	
Morariu (111)	3	a e	
Tolosa and Zeese (175)	7	e	

*Total is 35 more than the number of patients because there were several patients reported twice or more.

**a: clinical diagnosis
d: pathophysiology
e: EEG, EMG, neuroradiologic procedures, high function tests
f: biochemistry and pharmacology
g: nosography

TABLE IV - *Symptoms of PSP reported as appearing within the first year from the onset. Cases with neuropathological examination only*

Unsteady gait and abrupt falls	40 out of 58 cases, 68.9%
Blurred vision	14/22 63.6%
Poor mentation	26/50 52.0%
Postural abnormalities in upright stance	11/22 50.0%
Dysarthria and/or dysphagia	23/57 40.3%
Stiff face	15/51 29.4%
Ptosis	3/12 25.0%
Diplopia	1/4 25.0%
Bradykinesia	5/22 22.7%
Axial rigidity	10/52 19.2%
Difficulty in vertical voluntary gaze	9/58 15.5%
Failure of vergence	6/39 15.3%
Monotonous, soft voice	2/15 13.3%
Staring gaze	3/21 14.2%
Difficulty in horizontal voluntary gaze	2/36 5.5%

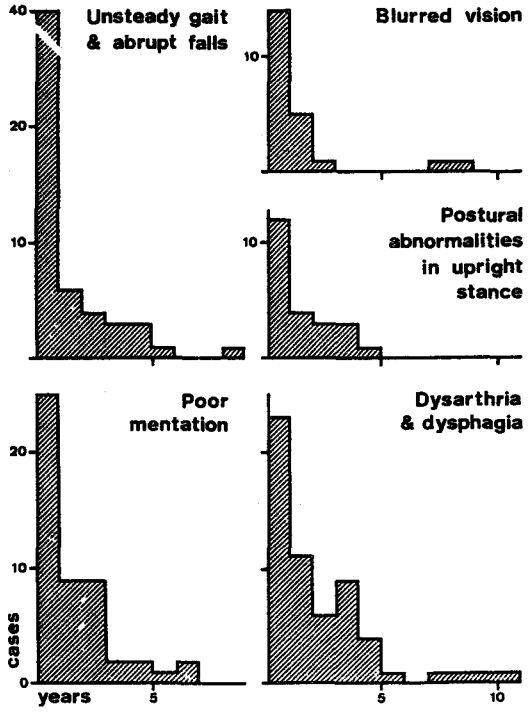

Fig. 3. *Frequency distribution of the onset of some symptoms of PSP, in relation to the course of the disease.*

3. The analysis of two such large case series confirmed that ophthalmoplegia was a clinical hallmark of PSP (Table V). Conjugate vertical voluntary movements proved to be affected more frequently than horizontal ones, while reflex movements were involved after ocular motility had been almost completely lost. In half of anatomical cases, slowness and limitation of both conjugate voluntary and vergence movements occurred 2-4 years after the onset of any other symptom (Fig. 4). Furthermore, it was found that ophthalmoplegia, so relevant to the clinical diagnosis, may also develop late in the course of the disease. Neurophysiological procedures showed that the fast component of both optokinetic and vestibular nystagmus as well as any other ocular reflexes of retinal and vestibular origin, remained for a long time normal [17, 18, 53, 96, 102, 108, 122, 123, 181, 182, 183]. Impairment of reciprocal inhibition mechanisms during conjugate voluntary movement, due to degeneration of tectal, tegmental, and possibly cerebellar neurons, was thought to account for supranuclear ophthalmoplegia [31, 84, 85, 108, 129]. These mechanisms were seldom corrected by oral L-dopa, amantadine, and methysergide [49, 63, 64, 68, 102, 105, 114, 136, 137, 158, 160, 163, 172]. Subsequent degeneration of oculomotor nuclei was commonly blamed for the progressive worsening of ocular motility, both voluntary and reflex [23, 48, 63, 71, 78, 100, 130, 135]. As to lid motility, staring gaze was found to be due to ocular immobility and progressive widening of the ocular fissures as well. However, ptosis and blepharospasm were seldom observed. Although pupils were generally thought to remain intact, the light reflex was involved on some occasions, and the near reflex was said to be abolished [18, 26, 86, 96, 127, 158, 160, 163, 171]. As a detailed study of the pupillary response to accommodation was lacking, and accommodation was likely often confused with vergence [39, 41, 48, 53, 63, 92, 96, 109, 132, 138, 151, 165, 166, 168], trouble in the accommodation reflex may be partly responsible for the blurred vision so frequently camplained of.

4. Other signs of supranuclear palsy mainly involving the oropharyngeal and laryngeal muscles, together with hyperactive muscle stretch reflexes and Babinski sign (Table VI), occurred quite frequently even in the early course. Dysarthria and dysphagia commonly preceded the onset of ophthalmoplegia. Dysarthria was shown to be due to involvement of voluntary rather than reflex movements [13, 14, 113]. On examination, vocal rhythmic and musical repetition tests were executed with difficulty (54, 149).

5. In almost half of anatomical cases, the so called extrapyramidal signs such as axial rigidity, stiff face, bradykinesia, postural abnormalities both in upright stance and during walking (Table VII), developed within the two years of onset (Fig. 5).

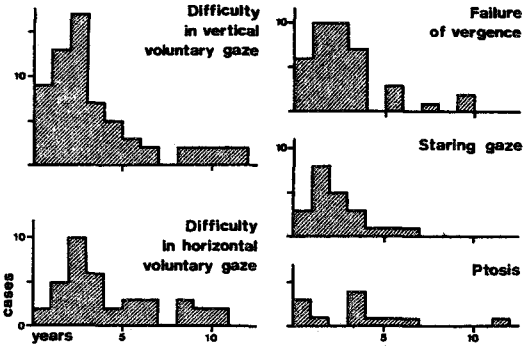

Fig. 4. *Frequency distribution of the onset of some ocular symptoms, in relation to the course of the disease.*

TABLE V - *Absolute incidence of ocular signs in PSP as resulting from 74 cases with neuropathological examination, and 310 clinical cases*

	Anatomical cases	Clinical cases
Limitation, slowness of upward voluntary movements, upward ophthalmoplegia	68	242
Limitation, slowness of downward voluntary movements, downward ophthalmoplegia	56	236
Limitation, slowness of horizontal voluntary movements, lateral gaze defect	45	189
Failure of vergence	44	139
Staring gaze, marked stare, stare with unfrequent blinking, retraction of the eyelids, lid opening apraxia	29	79
Light reflex, present	28	59
absent	*1*	*2*
Doll's head reflex, present	28	44
absent	*5*	*22*
Pursuit movement, absent	20	106
present	*5*	*71*
Ptosis	11	12
Miosis, anisocoria	10	14
Bell's phenomenon, absent	8	40
Optokinetic nystagmus, abnormal or absent	7	77
Spontaneous nystagmus	7	24
Evoked nystagmus, abnormal or absent	6	50
Blepharospasm	4	29
Diplopia	4	26
Saccadic movements, abnormal or absent	2	40
Internuclear ophthalmoplegia	2	6
Claude-Bernard-Horner syndrome	1	

In both case series, stiffness of neck and face was largely prevailing over rigidity of limbs and trunk. The neck was generally extended, but flexion and lateral rigidity were also noted. The results on these signs of oral anticholinergic drugs, L-dopa, and amantadine, were poor, while bromocryptine and methysergide were slightly effective in the early course [64, 136, 137].

6. Despite the severity of dentate nucleus involvement, cerebellar signs were in no case prominent (Table VIII). Ataxia of the trunk was encountered more frequently than incoordination. In only one anatomical case could ataxia be related to altered deep sensation [123].

7. Personality changes and poor mentation were confirmed as hallmarks of PSP from onset (Table IX). Poor mentation was shown to be due to slow associative activity rather than memory and intellectual defects [5,37]. Transient improvement of mentation resulted from shunt procedures [111].

8. Among other miscellaneous signs (Table X), muscular wasting with denervation potentials, seizures, and sleep changes were encountered on some occasions. EEG changes were detected in the advanced course and during sleep as well [41, 83, 95, 96, 98, 154, 170, 178, 179, 195]. Evoked auditory brain stem responses were normal [175]. No satisfactory explanation of abrupt falls was ever given.

TABLE VI - *Absolute incidence of supranuclear signs other than ocular*

	Anatomical cases	Clinical cases
Dysarthria	66	150
Hyperactive deep tendon reflexes, spasticity	56	96
Dysphagia	55	82
Babinski sign	38	52
Jaw-jerk	22	42
Explosive crying, exaggerated emotional responses	17	35
Glabellar reflex	10	20
Incontinence of urine	9	14
Difficulty with fine movements of the fingers	8	19
Grasp reflex	7	9
Snout reflex, orbicularis oris reflex	6	36
Palmomental reflex	6	27
Lingual movements slow, difficulty with rapid tongue movements	6	23
Pharyngeal reflex, absent	6	9
Explosive loughing	5	14
Hoffmann sign	1	7
Winking-jaw phenomenon	1	

Summing up, there is little doubt that middle-aged patients presenting with staring gaze, stiff and astonished face, impairment of conjugate voluntary eye movements and rigid neck extension could have escaped the diagnosis of PSP. A few years after onset the PSP syndrome is so stereotyped that cases prior to 1963, carefully described and presented as Parkinson's disease, postencephalitic parkinsonism, or so-called heterogeneous system degeneration, may well have been suffering from PSP (Table XI). On the contrary, early complaints such as unsteady gait, abrupt falls, blurred vision, dysarthria, dysphagia, slowness of movements, and axial rigidity, never suggested PSP until impairment of voluntary eye movements had appeared. The high diagnostic value assigned by clinicians to voluntary gaze defect was confirmed by the fact that this was the only sign concordantly found in both case series. After unquestionable gaze defect, no difficulty was encountered in differentiating PSP from Parkinson's disease [168], although several signs are probably common to both diseases [38, 46, 110, 157, 161].

Neuropathology and Nosography

Most pathological papers alluded to PSP as a system degeneration of the nervous system. In fact, loss of nerve cells, simple and pigmentary atrophy, fiber tract demyelination, gliosis, and neurofibrillary tangles, involved a large portion of the integrating motor system including basal ganglia, tectum, nuclei and fiber tracts of the tegmental portions of the brain stem, substantia nigra, locus coeruleus, inferior olives, dentate nucleus, and rarely spinal cord. Progressive degeneration caused slight atrophy of the brain, in particular the brain stem, which in more advanced cases could be

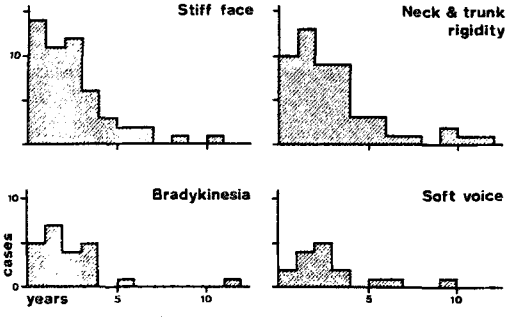

Fig. 5. *Frequency distribution of the onset of some extrapyramidal symptoms, in relation to the course of the disease.*

TABLE VII - *Absolute incidence of extrapyramidal signs*

	Anatomical cases	Clinical cases
Postural and gait troubles	95	181
not defined	*42*	*72*
retropulsion	*18*	*55*
reduced arm swinging	*7*	*29*
small steps	*5*	*22*
propulsion, festination	*4*	*12*
Rigidity, also dystonia, of the neck	64	175
extensor	*30*	*56*
not defined	*26*	*98*
flexor	*6*	*9*
lateral	*2*	*13*
absent		2
Spasticity, also stiffness, of the face, amimia, facial spasm, peripheral facial palsy, trismus	62	130
Bradykinesia	37	99
Rigidity of the limbs, gegenhalten	35	41
absent	*2*	*4*
Rigidity of the trunk, axial dystonia	34	67
Monotonous, soft voice, nasal speech	21	73
Parkinsonian tremor	12	41
absent	*14*	*29*
Cog-wheel	12	35
absent	*3*	*8*
Palilalia	5	20
Motor perseveration	5	8
Altered handwriting, micrographia	4	15
Salivation	3	9
Acathisia	2	1

TABLE VIII - *Absolute incidence of cerebellar signs*

	Anatomical cases	Clinical cases
Ataxia	13	7
absent	*12*	*2*
Dysmetria	10	16
absent	*11*	*13*
Romberg sign	6	8
absent	*2*	*2*
Adiadokokinesis	4	11
absent	*1*	
Tremor	1	9

detected during life by means of gas-encephalography and computer assisted tomography [21, 99, 126, 143, 172]. A gross clinico-pathologic correlation could also be traced between supranuclear signs and involvement of tegmental structures, nuclear signs and lesions of motor nerve nuclei, extrapyramidal signs and involvement of substantia nigra and striatum [20, 30, 38, 39, 42, 53, 55, 96, 106, 146, 168]. High levels of HVA in cerebrospinal fluid were thought to account for severity of nigral lesions [11, 32, 45, 91, 92, 96, 140]. Given the widespread distribution of lesions in the nervous system and some clinical similarities also, it has been speculated that PSP may belong to a group of non-familial, degenerative

TABLE IX - *Absolute incidence of mental symptoms*

	Anatomical cases	Clinical cases
Poor mentation	52	143
absent	*3*	*45*
Psychotic symptoms	6	5
Depression	3	10
Apathy		7

TABLE X - *Miscellaneous signs*

	Anatomical cases	Clinical cases
Abrupt falls	47	107
Blurred vision	24	87
Lethargy	9	2
Muscle wasting	7	8
Seizures	7	1
Insomnia	6	7
Apraxia	4	4
Athetosis, chorea, ballismus	4	1
Fasciculations	3	4
Aphasia	3	2
Righting reactions, abnormal	2	18
Dizzines	1	7
Deep sensation, abnormal	1	
Respiratory control failure		4
Echolalia		2
Photophobia		1

diseases including olivopontocerebellar atrophy, Parkinson's disease, striatonigral degeneration, and some related conditions [4, 24, 38, 39, 43, 61, 79, 97, 117, 121, 124, 139, 141, 164, 174, 177, 184, 185], and that there may be a phenotypical continuity from olivopontocerebellar atrophy through Parkinson's disease and PSP to striatonigral degeneration [56, 57, 107, 144]. The nosography of PSP has been also based upon neurofibrillary tangles involving subcortical structures, so a non-systemic subcortical argyrophilic dystrophy including PSP as well as any other condition with tangles except Alzheimer's disease, has been postulated [78. 156]. When PSP tangles were shown to consist of straight filaments approximately 15 nμ wide [28, 96, 128, 133, 148, 173], it became possible to keep PSP separate from any other disease with cortical and/or subcortical neurofibrillary changes, such as presenile and senile dementia, postencephalitic parkinsonism, parkinsonism-dementia complex of Guam, and Down syndrome, in which tangles consisted of paired helical filaments 22 nμ wide. Paired helical filaments were found on some occasions in PSP [70, 134, 176, 196], but the question was unanswered whether they originated from straight filaments or were related to concomitant nerve cell aging. A possible relationship of PSP to transmissible dementias was suggested by spongiform encephalopathy which developed in primates inoculated with a brain suspension of a patient affected by PSP [104].

Addendum. New papers on PSP appeared in 1979 after this editorial had been submitted: CHU F.C., REINGOLD D.B., COGAN D.G., WILLIAMS A.C: The eye movement disorders of progressive supranuclear palsy. Ophthalmol. (Rochester), 86: 422-428, 1979.
INSAUSTI T., FERREIRO J.L., BERTOTTI A.C., PUGLIESE M.I.: *Enfermedad de Steele-Richardson-Olszewski.* Prensa Med. Argent., 66: 157-161, 1979.

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TABLE XI - *Cases of PSP prior to 1963*

Year and Author	Number of cases	Clinical diagnosis original	Source of the new classification	Neuropathological examination	Subcortical tangles	Straight filaments at EM
1904 Posey [131], 1905 Spiller [162], and 1927 Cadwalader [29]	1	Postencephalitic parkinsonism	Behrman et al [20]			
1909 Janischewsky [77]	1	Parkinson's disease	Steele [166]			
1926 Alajouanine et al [2]	1	Extrapyramidal pseudobulbar syndrome	Behrman et al [20]			
1927 Crouzon et al [44]	1	Extrapyramidal syndrome	Constantinidis et al [37]			
1928 Alajouanine et al [3]	1	Extrapyramidal pseudobulbar syndrome	Constantinidis et al [37]			
1929 Cornil and Kissel [40]	1	Extrapyramidal syndrome	Behrman et al [20]			
1932 Français and Vernotte [60]	1	Extrapyramidal syndrome				
1936 Ford and Walsh [59]	1		Behrman et al [20]	yes		
1940 Verhaart [188]	1	Unclassified degenerative disease		yes		
1951 Chavany et al [34]	1	Postencephalitic parkinsonism	Steele et al [168]	yes	yes	
1958 Verhaart [189]	1	Heterogenous systemic degeneration	Steele et al [168]	yes		
1961 Neumann [118, 119, 120]	1	Heterogenous system degeneration	Steele et al [168]	yes	yes	
1961 Brusa [25]	1	Multisystem degeneration	Steele et al [168]	yes	yes, Steele et al [168]	yes, Bugiani et al [28]
1963 Barraquer-Bordàs [19]	1	Pseudobulbar syndrome	Giménez-Roldàn and Esteban [63]			

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