

Binocular Diplopia as a Diagnostic Gateway to Neurological Disorders: A 19-Year Retrospective Study

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Objective: Diplopia is a frequent yet diagnostically complex symptom with a broad range of underlying causes. While monocular diplopia is typically associated with ocular abnormalities, binocular diplopia is more often related to neurological or systemic disorders. This study aimed to analyze the etiological distribution of diplopia in a hospital-based neurology setting.

Materials: This is a retrospective, observational, descriptive-analytical study was conducted through a review of Hospital Discharge Records (Schede di Dimissione Ospedaliera - SDO) of patients admitted to the Neurology Clinic of the "G. Rodolico - San Marco" University Hospital in Catania between 1st January 2005 and 31st December 2023. Patients whose primary reason for hospital admission was binocular diplopia were included in the analysis.

Methods: Patients were categorized according to the final diagnosis associated with their diplopia. Clinical records were reviewed for neurological and ophthalmological examinations, laboratory testing, neuroimaging, and electrophysiological studies. Diagnoses were classified into etiological categories: cranial nerve palsies, neuromuscular junction disorders, demyelinating diseases, vascular, endocrine, and idiopathic conditions.

Results: Among 9,388 patients admitted to the Neurology Unit during the study period, 121 (1.3%) patients, with a mean age of 54.3 ± 17.1 years, were included. The most frequent diagnosis was cerebrovascular disease (27 patients; 22.3%), followed by cranial nerve neuropathies (21; 17.4%) and myasthenic syndromes (17; 14%) (figure 1). Demyelinating diseases were identified in 10 (8.3%) patients, while 7 (5.8%) patients had functional disorders and 7 (5.8%) had thyroid eye disease. A total of 6 (5%) patients remained without a definitive diagnosis. When stratified by age, demyelinating diseases were significantly more common in younger patients (≤ 50 years; 9/10 patients), whereas cerebrovascular disease (22/27) and cranial nerve neuropathies (18/21) predominated in those over 50 (Table 2). Moreover, 32 patients (26.4%) presented with diplopia accompanied by additional neurological signs. In this subgroup, demyelinating diseases (7/10) and cerebrovascular conditions (6/27) were the most frequent. Conversely, myasthenia gravis (14/17) and functional disorders (7/7) more often presented as isolated diplopia.

Discussion: Our findings confirm the considerable etiological heterogeneity of binocular diplopia and emphasize the diagnostic relevance of age and associated neurological signs. Cerebrovascular diseases and cranial nerve neuropathies were the most common causes overall, especially in older patients, in line with known epidemiological patterns. In contrast, demyelinating diseases were more prevalent in younger patients, highlighting the importance of considering age at onset during diagnostic evaluation.

Table 1. Demographical characteristics

Etiologies	Mean age (years)	Sex (M/F)
N (%)		
Cerebrovascular diseases (27; 22.3%)	60.2 \pm 10.4	13/14
Cranial nerve neuropathies (21; 17.4%)	62.9 \pm 17.3	14/7
Myasthenic syndromes (17; 14.0%)	52.8 \pm 17.4	12/5
Ophthalmologic disorders (11; 9.1%)	36.4 \pm 11.2	6/5
Demyelinating diseases (10; 8.3%)	36.1 \pm 8.9	3/7
Space-occupying lesions (10; 8.3%)	56.2 \pm 20.2	6/4
Psychiatric/functional disorders (7; 5.8%)	35.7 \pm 7.7	2/5
Internal medicine diseases (6; 5%)	49.0 \pm 18.3	1/5
Undefined (6; 5%)	47.1 \pm 12.2	3/2
CSF hypo/hypertension (4; 3.3%)	34.8 \pm 10.2	0/2
Myopathies (1; 0.8%)	55.0 \pm 0	1/0
Parkinson's disease / parkinsonism (1; 0.8%)	62.0 \pm 0	1/0

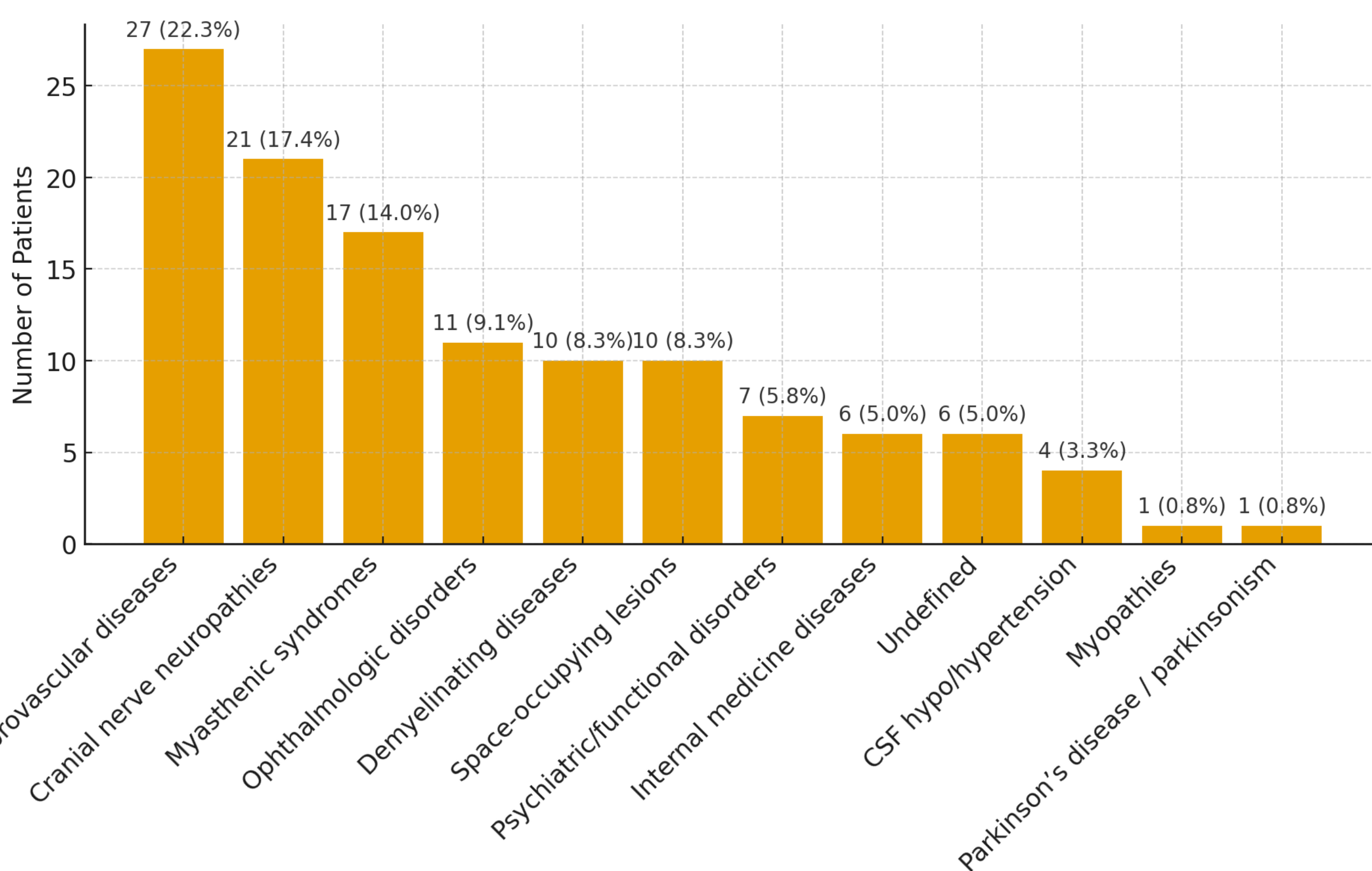


Figure 1. Overall Distribution of Etiologies.

Table 2. Comparison of Etiologies by Age Group

Etiologies	Age ≤ 50 years n=53 (43.8%)	Age >50 years n=68 (56.2%)	P value Fisher test
<i>Demyelinating diseases</i>	9 (17)	1 (1,5)	<0,0001
<i>Myasthenic syndromes</i>	8 (15,1)	9 (13,2)	0,8
<i>Psychiatric/functional disorders</i>	6 (11,3)	1 (1,5)	0,05
<i>Ophthalmologic disorders</i>	5 (9,4)	6 (8,8)	0,5
<i>Cerebrovascular diseases</i>	5 (9,4)	22 (32,4)	0,004
<i>Cranial nerve neuropathies</i>	3 (5,7)	18 (26,5)	0,003
<i>Space-occupying lesions</i>	5 (9,4)	5 (7,4)	0,7
<i>Internal medicine diseases</i>	4 (7,5)	2 (2,9)	0,4
<i>CSF hypo/hypertension</i>	4 (7,5)	0	NA
<i>Myopathies</i>	0	1 (1,5)	NA
<i>Parkinson's disease / parkinsonism</i>	1 (1,9)	0	NA
<i>Undefined</i>	3 (5,7)	3 (4,4)	0,9

Conclusion: Binocular diplopia may be the initial manifestation of various neurological disorders. A structured, multidisciplinary diagnostic approach enhances etiological identification; however, one in five patients remains without a defined cause. Early recognition and targeted investigations are critical to reduce diagnostic delays and optimize clinical outcomes.

Bibliography.

Alves, M., Miranda, A., Narciso, M. R., Mieirol, L., & Fonseca, T. (2015). Diplopia: a diagnostic challenge with common and rare etiologies. *The American Journal of Case Reports*, 16, 220–223.
Dinkin, M. (2014). Diagnostic approach to diplopia. *Continuum (Minneapolis, Minn.)*, 20(4 Neuro-ophthalmology), 942–965.
Leigh, R. J., & Zee, D. S. (2015). *The Neurology of Eye Movements*. Oxford University Press