# A difficult diagnosis. A case of progressive palsy with a tiger-eye effect on MRI


## Abstract:

The presented clinical case describes a rare occurrence of progressive palsy with a tiger-eye effect on MRI. The issues of the workup and differential diagnosis were discussed. There was an argument that along with other MRI criteria for the diagnosis of PSP, the above described symptom of the "tiger eye" may occur in some patients with this disease. This radiological sign serves as a pathological correlative, indicating the possibility of developing neurodegenerative disease according to a single universal mechanism of neuronal death in various parts of the brain that determine the specificity of clinical manifestations.


Key words: progressive supranuclear palsy, diagnosis, MRI, neurodegenerative diseases


## Introduction:

Richardson, Steele and Olszewski, in 1963, described a syndrome characterized by progressive parkinsonism with frequent falls due to postural instability, supranuclear ophthalmoplegia, mainly in the vertical plane, pseudobulbar palsy, dystonic rigidity of the neck and upper arm muscles, and moderate cognitive deficiency in nine patients [1, 8, 11]. A further neuropathological post-mortem study demonstrated that in this condition, the basal ganglia, stem structures and the cerebellum are affected, with a predominance of pathological implants in the form of neurofibrillary tangles (NFTs), granules of degeneration, loss of neuronal cells and gliosis [7]. This syndrome is called progressive supranuclear palsy (PSP) and is regarded as the most common form of atypical parkinsonism today [1, 11, 17]. The PSP frequency is 5-7 cases per 100,000 population [8, 9, 11]. A recent UK study found that the peak incidence of PSP is at the age of 70–74 years with a prevalence of 18 cases per 100,000 population [9]. In persons older than 80 years, the PSP occurence rate is on average 14.7 cases per 100,000 population [7, 9]. Japanese STUDY OF autopsy materials, However, suggests that the occurence of the PSP frequency in elderly people may be

even higher [15].

The etiology and pathogenesis of PSP is not fully understood. The disease belongs to the tauopathi esgroup (the same group includes Pick's disease, Parkinsonism-ALS-dementia, cortico-basal degeneration, primary age-related tauopathy (PART) / Neurofibrillary tangle-predominant senile dementia, chronic traumatic encephalopathy, fronto-temporal dementia, Lytico-Bodig disease, ganglioglioma and gangliocytoma, meningoangiomatosis, post-encephalic parkinsonism and subacute sclerosing panencephalitis, etc.), in which certain hyperphosphorylated-protein forms are accumulated in neurons and glial cells [2, 4, 10, 12]. Several PSP clinical phenotypes are known, They include PSP with Richardson's syndrome (PSP-RS), PSP with predominant parkinsonism (PSP-P), PSP with pure akinesia AND gait freezing (PSP-PAGF), PSP with corticobasal syndrome (PSP -CBS), PSP with predominant speech and/or language dysfunction (PSP-AOS and PSP-PNFA - PSP-progressive non fluent aphasia), PSP with predominant frontotemporal dysfunction (PSPFTD), PSP with cerebellar ataxia (PSP-C), PSP with primary lateral sclerosis (PSP- Pls) [14].

With the development of neuroimaging technologies, descriptions of a number of symptoms typical for PSP have appeared [3, 5, 8, 13, 18]. Conventional magnetic resonance imaging (MRI) in T2 mode at 1.5 T in patients with atypical parkinsonism shows a low level of the signal in the putamen of the lenticular nucleus. This low signal is AS A result of an increased iron content [5, 13].The MRI of approximately 70-80% patients with PSP show a decrease in the anteroposterior size of the midbrain with the formation of the Mickey Mouse symptom [13, 16, 18].

According to Boxer A. et al. atrophy of the midbrain and upper cerebellar peduncles is an important criterion for the differentiation of PSP-RS and other clinical forms of parkinsonism [3]. It should be noted that the MRI signs of PSP are highly specific but less sensitive than clinical criteria [8, 13, 18]. “Hummingbird” and “morning glory flower” symptoms OF PSP WITH 100% specificity are described, but their sensitivity is 68.4% and 50%, respectively) [13].

Also known is the so-called MRI parkinsonism index (MRPI) with a sensitivity of 100% and specificity of 99.2% –100% for PSP-RS []. The ratio of the sizes of the pons and the midbrain [13] is also used as a diagnostic

criterion. Further research in which the prospects for the use of functional MRI, PET and other modern neuroimaging methods in PSP [4, 9] are being considered.

Scientific databases OVID, PubMed, EMBASE, have published more than 400 scientific papers within the periods of 2009-2019, on the problems of diagnosing PSP. Nevertheless, only two of them mention the diagnostic role of the tiger eye symptom [1, 8], which is usually associated with a form of the neurodegeneration with brain iron accumulation - pantothenate kinase-associated neurodegenaration (PKAN) - (Hallervorden – Spatz syndrome) [6]. Particular for PSP, AND also occuring in Wilson-Konovalov disease, FOS poisoning, and some other pathological conditions [5, 7, 13]. With a high resolution MRI (3 T or more), the sign of a “tiger eye” could occur even in healthy subjects [13].

The presentation of the case.

This study is devoted to the description of the case of PSP with a pronounced "tiger eye" symptom during an MRI scan.

Patient L., born in 1951, was treated in the neurological department of the Regional Clinical Hospital (Odessa, Ukraine) in December 2018. Her son reported that, the patient had been suffering from this condition for 10 years. at its early stages; slow movements, lethargy, periodic episodes of dizziness were experienced, accompanied WITH A LOSS OF BALANCE FALLING FORWARD. As the disease progressed, gait worsened. AND ABOUT one and a half years ago symptoms as a frozen look appeared, speech deterioratION, and swallowing disorders occurred in the form of choking when eating, memory LOSS, voice changes.

Neurological examination showed decrease in cognitive functions (MMSE = 18 points), hypomimia, paralysis of the vertical gaze - there are no saccades, restriction in eyeballs movements vertically, slowing down of horizontal saccades, mild dysphagia, mild dysarthria. Pharyngeal and palatal reflexes were diminished. There were bilateral brisk tendon and periostal reflexes, D = S. Positive hand pathological signs. Rough symptoms of oral automatism and resistance to passive movements affecting both agonist and antagonist muscles with periodic cogwheel-like modifications of muscle tone was detected. She had slow gait and was unstable in the Romberg position. Patient failed finger-nose test in the sitting position. Convincing data for the violation of sensitivity is not available. Incontinence was experienced

periodically. Comparing the mri performed on admission, changes (Fig. 1) in the region of the subcortical nuclei were traced to be a decrease in the signal intensity of the medial segments of the pallidum on T2-weighted axial images (due to excessive accumulation of iron) in the longitudinal hyperintensive area (area of gliosis and vacuolization).

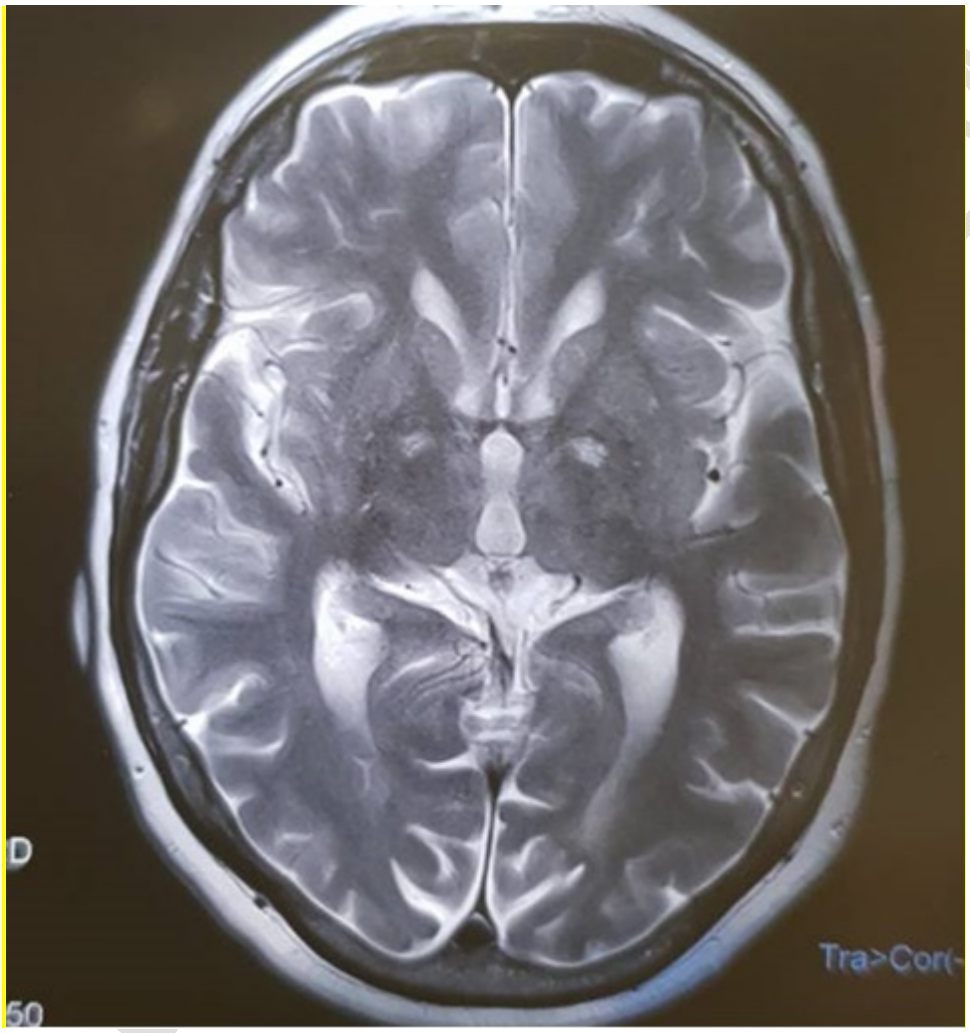


Fig. 1 Symptom "eye tiger" in a patient with PSP

The patient WAS diagnosed with progressive supranuclear palsy (Richardson-Steele-Olszewski disease) with symptoms of atypical parkinsonism, paralysis of the vertical gaze and mild subcortical-frontal

dementia.

Discussion.

Until recently, the “tiger eye” symptom was considered pathognomonic for Hallervorden – Spatz syndrome only. This is a rare autosomal recessive disorder which mainly affects the basal ganglia and is associated with the accumulation of iron in the brain. The most characteristic signs of the disease are parkinsonian syndrome, various types of hyperkinesis, pyramidal signs, cognitive decline, pigmentary retinopathy and atrophy of the optic nerves [6].

Davie C. et al. (1997) showed the results of MRI scanning and proton MR spectroscopy, performed in nine patients with PSP-RS [5]. Three of them showed characteristic signs of the "tiger eye" symptom. The authors believe that this symptom can be used for the differential diagnosis of various forms of atypical parkinsonism.

Some authors consider that at the present time there is no reason to consider the symptom of the "tiger eye" as pathognomonic exclusively for Hallervorden – Spatz syndrome aka PKAN. In particular, in a number of observations, changes in the medial segments of globus pallidus on T2-weighted axial images were due to multisystem atrophy and neuroferritinopathy [9].

Conclusion

Along with other MRI criteria for the diagnosis of PSP, the MRI sign symptom of the "tiger eye" may occur in some patients with this disease. This radiological sign serves as a pathological correlate, indicating the possibility of developing neurodegenerative disease according to a single universal mechanism of neuronal death in various parts of the brain that determine the specificity of clinical manifestations.

CONSENT

Not applicable.

ETHICAL APPROVAL

The manuscript was approved by LEC of Odessa Regional Hospital.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES


1. Arena JE, Weigand SD, Whitwell JL, Hassan A, Eggers SD, Höglinger GU, Litvan I, Josephs KA. Progressive supranuclear palsy: progression and survival. J Neurol. 2016 Feb;263(2):380-389.
2. Arendt T, Stieler JT, Holzer M. Tau and tauopathies. Brain Res Bull. 2016 Sep;126(Pt 3):238-292.
3. Boxer AL, Yu JT, Golbe LI, Litvan I, Lang AE, Höglinger GU. Advances in progressive supranuclear palsy: new diagnostic criteria, biomarkers, and therapeutic approaches. Lancet Neurol. 2017 Jul;16(7):552-563.
4. Coakeley S, Cho SS, Koshimori Y, Rusjan P, Harris M, Ghadery C, Kim J, Lang AE, Wilson A, Houle S, Strafella AP. Positron emission tomography imaging of tau pathology in progressive supranuclear palsy. J Cereb Blood Flow Metab. 2017 Sep;37(9):3150-3160.
5. Davie CA, Barker GJ, Machado C, Miller DH, Lees AJ. Proton magnetic resonance spectroscopy in Steele-Richardson-Olszewski syndrome. Mov Disord. 1997 Sep;12(5):767-71.
6. Dilli A, Ayaz UY, Sarıkaya S, Kaplanoglu H, Hekimog Lu B. Hallervorden-Spatz Syndrome. JBR-BTR. 2015 Jun 1;98(3):115-116
7. Eusebio A, Koric L, Félician O, Guedj E, Ceccaldi M, Azulay JP. Progressive supranuclear palsy and corticobasal degeneration: Diagnostic challenges and clinicopathological considerations. Rev Neurol (Paris). 2016 Aug - Sep;172(8-9):488-502.
8. Golbe LI. Progressive supranuclear palsy. Semin Neurol. 2014 Apr;34(2):151-9.
9. Höglinger GU, Respondek G, Stamelou M, Kurz C, Josephs KA, Lang AE, Mollenhauer B, Müller U, Nilsson C, Whitwell JL, Arzberger T, Englund E, Gelpi E, Giese A, Irwin DJ, Meissner WG, Pantelyat A, Rajput A, van Swieten JC, Troakes C, Antonini A, Bhatia KP, Bordelon Y, Compta Y, Corvol JC, Colosimo C, Dickson DW, Dodel R, Ferguson L, Grossman M, Kassubek J, Krismer F, Levin J, Lorenzl S, Morris HR, Nestor P, Oertel WH, Poewe W, Rabinovici G, Rowe JB, Schellenberg GD, Seppi K, van Eimeren T, Wenning GK, Boxer AL, Golbe LI, Litvan I; Movement Disorder Society-endorsed

PSP Study Group. Clinical diagnosis of progressive supranuclear palsy: The movement disorder society criteria. Mov Disord. 2017 Jun;32(6):853-864.
10. Kovacs GG. Tauopathies. Handb Clin Neurol. 2017;145:355-368.
11. Lopez G, Bayulkem K, Hallett M. Progressive supranuclear palsy (PSP): Richardson syndrome and other PSP variants. Acta Neurol Scand. 2016 Oct;134(4):242-9.
12. Perez-Soriano A, Stoessl AJ. Tau imaging in progressive supranuclear palsy. Mov Disord. 2017 Jan;32(1):91-93.
13. Radioaedia. https://radiopaedia.org/articles/hummingbird-sign-midbrain
14. Respondek G, Höglinger GU. The phenotypic spectrum of progressive supranuclear palsy. Parkinsonism Relat Disord. 2016 Jan;22 Suppl 1:S34-6.
15. Sako W, Murakami N, Izumi Y, Kaji R. Usefulness of the superior cerebellar peduncle for differential diagnosis of progressive supranuclear palsy: A meta-analysis. J Neurol Sci. 2017 Jul 15;378:153-157.
16. Multisystem atrophy or progressive supranuclear palsy? Polyanskaya OV, Kutashov V.A. Bulletin of medical online conferences. 2017. V. 7. № 7. P. 1362-1365 [Rus]
17. Progressive supranuclear palsy (syndrome Steele-Richardson-Olszewski): description of the population cohort of patients Moskovko S.P. Ukrainian Herald of Psychoneurology. 2005. T. 13. No. 4 (45). P. 25-29 [Ukr]
18. Difficulties of differential diagnosis of progressive supranuclear palsy and Parkinson's disease Magzhanov R.V., Davletova A.I., Ibatullin R.A., Tunik V.F., Idrisova R.F., Bakhtiyarova K.Z. Annals of Clinical and Experimental Neurology. 2016. Vol. 10. No. 4. P. 58-61 [Rus]