Case Report

Wilson's disease- A neurodegenerative disease

Vidhya Guna Sekaran

From Assistant Professor, Department of Medical Surgical Nursing, Jawaharlal Institute of Post graduate Medical Education and Research, Puducherry, India

ABSTRACT

Wilson's disease (WD) (hepatolenticular degeneration) is a rare autosomal recessive disorder caused by mutations in the *ATP7B* gene. Copper concentration in the liver is a diagnostic and prognostic indicator for the disease. Here, I present the case of a 52-year-old male, a known chronic smoker, who presented with a history of recurrent backwards falls, slowness of all activities, head titubation, slurred speech, and tremors of the right upper limb and both lower limbs. Normal hepatic copper levels typically range from 15 to 55 µg/g dry weight. Neurological assessment revealed +2 in deep tendon reflexes, and cerebellar function tests showed that there were involuntary, irregular, rhythmic coarse tremors of both upper and lower limbs, diadochokinetic, and impaired tandem walking. WD was identified, and he was started on chelation therapy and a metallothionein inducer to inhibit intestinal absorption and fecal excretion of copper. Hence, highlighting this case helps to understand the originality of the patient's condition.

Key words: Autosomal recessive, Cerebellar function, Copper concentration, Dysdokokinesia

Wilson's disease (WD), initially referred to as "progressive lenticular degeneration," was first described by Samuel Alexander Kinnier Wilson, a British neurologist, in 1912 [1]. WD is an autosomal recessive disorder that results in the excess accumulation of copper in the liver, heart, brain, cornea, and other organs [2]. The diagnosis of WD often poses a challenge due to its ability to affect organs and develop diseases such as non-ischemic cardiomyopathy in the heart, arthritis in the bones, and proximal renal tubular dysfunction in the kidneys. In particular, a diagnosis of disease is established when the hepatic concentration exceeds 250 µg/g [3]. Later, the neuropsychiatric symptoms develop within the third and fourth decades of life.

I report a case of neurodegenerative WD initially suspected to be a hepatic condition on laboratory investigation, but subsequently diagnosed through a neurological scan.

CASE REPORT

A 52-year-old male presented with a history of recurrent backwards falls, slurred speech, head titubation, tremors, and swaying while walking over a 1-year duration. There was a history of falls, 1–2 episodes/month without loss of consciousness, giddiness, etc. Currently, he was experiencing 5–6 episodes/month with minor abrasions in the posterior aspect of the head and neck, and now, the patient cannot walk without help. He had no cardiorespiratory symptoms. The patient has a history of consanguineous marriage and a personal history of chronic smoking (beedi) for the past 20 years. He smokes 3 rolls per day (each roll has 11 beedis).

The physical examination results were deep tendon reflexes—2+; cerebellar function during neurological assessment was involuntary, irregular, rhythmic, coarse tremors of both upper limbs, right >left. Dysdiadochokinesia, impaired tandem walking, and right upper limb resting tremors were noted. The Scale for Assessment and Rating of Ataxia was used. The results were gait: Score - 2 Indicates considerable staggering, with difficulties in a half-turn, but without support. Stance: Score 2 indicates able to stand feet together >10 s but only with sway. Sitting: Score - 2 Indicates constant sway but able to sit >10 s without support. Speech Disturbance: Score - 2 Indicates impaired speech but easy to understand. Finger chase: Score 3—tremor with an amplitude >5 cm. Fast alternating movements: Score - 3 **(**Very irregular, single movements, difficult to distinguish or relevant interruptions, performs >10 s). Heel-shin slide: Score - 1.5 (slightly abnormal, contact maintained to the shin). Other physical findings were normal. The patient underwent routine investigations, which showed elevated copper concentration in blood (450 µg/g). A neurology scan was done to evaluate the

Access this article online	
Received - 07 July 2025 Initial Review - 23 July 2025 Accepted - 24 August 2025	Quick Response code
DOI: 10.32677/ijcr.v11i9.7716	

Correspondence to: Vidhya Guna Sekaran, No.47, Ramaiah Street, IV Cross Paris Nagar, Moolakulam, Puducherry - 605010, India. E-mail: Vidhyaguna9049@gmail.com

neurodegenerative lesions, which showed progressive supranuclear palsy (Fig. 1).

The patient was followed and monitored for response after chelation therapy, such as Penicillamine 15–20 mg/day and elemental zinc 50 mg thrice daily. The target therapy is urinary excretion of copper, approximately 200–500 mg/24 h. (3–8 mol/24 h.). After a week, assess the aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels and administer a metallothionein inducer to inhibit intestinal absorption and promote fecal excretion of copper.

DISCUSSION

WD is an excessive accumulation of copper in the liver, heart, kidneys, cornea, and other organs. Primarily, it affects the hepatic system in the first decades of life. In the third and fourth decades of life, it gradually affects the neurological system. The main cause of this disease is a mutation in the *ATP7B* gene [4]. The *ATP7B* gene encodes the protein transporter, which is responsible for excreting copper into bile and out of the body by chromosomes 13q, which are located in the trans-Golgi network of hepatocytes [4].

The liver is the main pathway for excreting copper. However, the excess accumulation in the liver cannot be excreted by the liver and circulates in the blood, where it is dispersed to other organs. Moreover, the surplus copper results in the formation of free radicals, which subsequently lead to the oxidation of essential proteins and lipids [4].

This surplus copper causes the development of a harmful hydroxyl group, which heightens oxidative stress in cells and injures tissues. Consequently, this damage leads to active hepatitis and fibrosis, along with increased levels of serum transaminases, particularly AST and ALT. Free copper collects in multiple organs, such as the brain, kidneys, and eyes. In the brain, copper deposits in areas such as the basal ganglia, putamen, and globus pallidus play a role in movement coordination and neurocognitive functions, such as regulating mood [4].

Patients might experience symptoms such as weakness, changes in personality, depression, headaches, difficulty sleeping, and tremors. Around 30–50% of individuals present with neuropsychiatric symptoms, which often include an uneven tremor [1]. Additional symptoms can include ataxia, hypophonia, dysarthria, and lack of coordination. Other characteristics associated with WD may encompass movement disorders, spasticity, rigidity, tremors, hypophonia, and dysarthria [2,5].

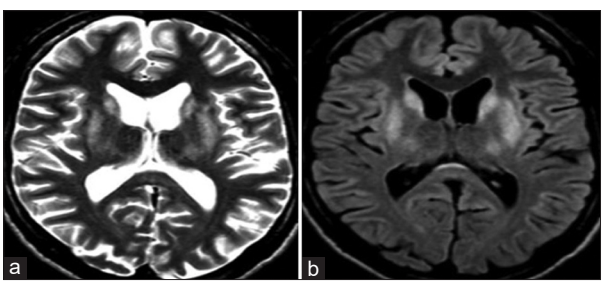

Figure 1: Hyperintense changes localised in the putamen, head of the nucleus caudate and thalamus in T2-weighted sequences (a) and fluid-attenuated inversion recovery (b)

Diagnosing WD is quietly challenging due to liver and brain involvement. The Kayser–Fleischer ring in the cornea provides a clue to recognize a patient with WD. The measurement of serum ceruloplasmin, copper, and urinary copper estimation helps to diagnose WD. Serum ceruloplasmin is low in WD patients (normal range of 30–50 mg/dL, which may vary between labs). One of the recent studies has shown that serum ceruloplasmin levels <10 mg/dL have a positive predictive value of 100% WD [6]. A liver biopsy with copper measurement indicating levels >250 μg/g dry weight is considered diagnostic for WD [3]. Magnetic resonance imaging scans are utilised to evaluate any cerebral involvement, showing hyperintensities in the basal ganglia, putamen, and globus pallidu [6].

Copper chelation remains the primary treatment and should be initiated for patients with any level of organ involvement. There are various chelators available, such as D-penicillamine and trientine. D-Pencillamine enhances the excretion of copper [7]. The initial treatment should commence at 250–500 mg/kg/day, increasing by 250 mg increments every four to 7 days until reaching 1000–1500 mg/day (no more than 2000 mg/day) in two to four divided doses. For maintenance therapy in adults, the recommended dosage is 750–1000 mg/day, administered in two divided doses. Zinc is generally employed as a key therapy in conjunction with other copper chelators, rather than as a sole treatment option [7].

Deep brain stimulation is tried in patients with selected cases of refractory tremors and dystonia, targeting the ventral intermediate nucleus of the thalamus and globus pallidus interna, respectively, with promising results [8]. In patients with disabling dysphagia, neuromuscular electric stimulation has shown beneficial results. Along with copper chelators and symptomatic medications, a comprehensive approach involving multidisciplinary care, including speech therapy, physiotherapy, and occupational therapy, often leads to good clinical outcomes [8].

Molecular therapy targeting ATP7B and its function has also been tried in WD. However, its clinical utility is still being researched. Transplantation of ATP7B mRNA-expressing cells into the liver has also been tried to restore the standard functional capacity of the liver [9]. However, a significant limitation is the requirement of at least 40% of normal functioning cells in the liver to normalize copper metabolism, which limits the utility of this technique in WD patients [10].

Patients with WD are advised to follow a low-copper diet. It involves avoiding copper-rich foods such as shellfish, liver, nuts, chocolates, vegetables such as asparagus, potatoes with skin, and soybean sprouts. Overall, copper intake should be restricted to <0.9 mg/day [9].

Genetic counselling is also one of the treatment modalities. Hence, couples counselling is a better option

for treating the patient and planning for any future pregnancy [11].

CONCLUSION

WD is a rare genetic disorder characterised by the accumulation of copper in various organs of the body, particularly the liver, brain, and eyes. Although a cure does not exist, prompt diagnosis and treatment can successfully manage symptoms and avert serious complications, enabling those affected by WD to maintain a relatively normal lifestyle.

REFERENCES

1. Ganaraj VH, Holla VV, Pal PK. Current management of neurological Wilson's disease. Tremor Other Hyperkinet Mov (N Y) 2025;15:17.
2. Bhattacharya K, Thankappan B. Wilson's disease update: An Indian perspective. Ann Indian Acad Neurol 2022;25:43-53.
3. Pachipala S, Agarwal A, Garg D, Garg A, Srivastava AK. Diagnosis and management of Wilson's disease: Current perspectives, Ann Mov Disord 2023;6:115-25.
4. Immergluck J, Grant LM, Anilkumar AC. Wilson disease. In: StatPearls. Treasure Island, FL: StatPearls Publishing; 2025. Available from: https://www.ncbi.nlm.nih.gov/books/nbk441990 [Last accessed on 2025 Jun 24].
5. Członkowska A, Litwin T, Chabik G. Wilson disease: Neurologic features. Handb Clin Neurol 2017;142:101-19.
6. Abbassi N, Bourrahouat A, Bedoya EC, Belmalih A, El Hanafi FZ, Bost M, *et al*. Epidemiology, clinical features, and mortality rate of Wilson disease in Moroccan children: A pediatric case series. Arch Pédiatr 2022;29:453-8.
7. Patil M, Sheth KA, Krishnamurthy AC, Devarbhavi H. A review and current perspective on Wilson disease. J Clin Exp Hepatol 2013;3:321-36.
8. Hedera P. Treatment of Wilson's disease motor complications with deep brain stimulation. Ann N Y Acad Sci 2014;1315:16-23.
9. Park SM, Vo K, Lallier M, Cloutier AS, Brochu P, Alvarez F, *et al*. Hepatocyte transplantation in the Long Evans Cinnamon rat model of Wilson's disease. Cell Transplant 2006;15:13-22.
10. Lemann J Jr., Adams ND, Wilz DR, Brenes LG. Acid and mineral balances and bone in familial proximal renal tubular acidosis, Kidney Int 2000;58:1267-77.
11. Vukasovic I. Wilson's disease. EJIFCC 2004;15:104-6.

Funding: Nil; Conflicts of interest: Nil.

How to cite this article: Sekaran VG. Wilson's disease- A neurodegenerative disease. Indian J Case Reports. 2025; 11(9):467-469.