Vitamin B12 Deficiency Associated with Hashimoto and Post Radiation Encephalitis: Three case reports

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ABSTRACT :

Vitamin B12 deficiency may complicate various neurological disorders, including autoimmune encephalitis and radiation induced brain injury, we present three cases-two involving Hashimoto encephalitis and one involving post radiotherapy leukoencephalopathy- in which severe vitamin B12 deficiency contributed to clinical deterioration.

The first two patients were women with Hashimoto thyroiditis who presented with acute neuropsychiatric manifestations, elevated anti thyroid antibodies, and steroid responsive encephalopathy, both exhibited profound cobalamin deficiency during relapses, the third patient developed early post radiation encephalopathy one month after cranial radiotherapy, with massive reversible leukoencephalopathy and subsequently confirmed severe vitamin B12 deficiency

These observations highlight the need for systematic assessment of vitamin B12 levels in patients presenting with autoimmune or post radiation encephalopathy, as supplementation may significantly improve clinical outcomes.

Key words: *Vitamin B12 deficiency; Hashimoto encephalopathy; post radiation encephalopathy; leukoencephalopathy; autoimmune encephalitis.*

INTRODUCTION :

Vitamin B12 deficiency is a frequent but underdiagnosed cause of neurological and psychiatric disturbances, beyond its classical manifestations such as neuropathy, myelopathy, cognitive decline, and psychiatric symptoms, cobalamin deficiency may aggravate pre existing neurological conditions, particularly autoimmune encephalitis and radiation induced brain injury **[1-5].**

Hashimoto encephalitis is a rare autoimmune, steroid responsive encephalopathy associated with elevated anti thyroid antibody titers, clinical presentations are highly variable, encompassing confusion, seizures, psychosis, behavioral disturbances, and cognitive dysfunction **[6-11].**

Post radiation encephalopathy-especially in the early delayed phase occurring 1-3 months after cranial radiotherapy-is characterized by reversible white matter injury, cognitive impairment, somnolence, and encephalopathy the condition is partly mediated by inflammatory and demyelinating mechanisms **[12-15].**

As myelin metabolism depends on adequate vitamin B12 levels, deficiency may worsen autoimmune or radiation induced demyelination **[17].**

We describe three patients-two with Hashimoto encephalitis and one with post radiation leukoencephalopathy-in whom severe vitamin B12 deficiency played a significant pathophysiological role.

CASE REPORTS :

CASE 01 :

A 50 year old woman presented with acute paranoia, fluctuating confusion, and frontal syndrome behavioral disturbances. MRI and CSF were unremarkable.

Inflammatory markers showed mildly elevated ESR. Hormonal testing was normal, but anti TPO antibodies were markedly increased. She exhibited a rapid and complete response to corticosteroids.

Nine months later, she was re hospitalized for mental confusion and extrapyramidal rigidity. Routine laboratory studies were normal, but vitamin B12 levels were profoundly low (1.5 pg/mL).

Parenteral cobalamin replacement resulted in spectacular neurological improvement within three days.

CASE 02 :

A 48 year old woman with a history of epilepsy, hypertension, diabetes, and hyperthyroidism presented with fever, agitation, confusion, prosopagnosia, seizures, and left hemiparesis.

MRI showed mild atrophy; CSF was normal. She had severely elevated anti TPO and anti TSI antibodies. She improved rapidly on corticosteroids but experienced several relapses over subsequent years.

During a relapse in 2019, vitamin B12 levels were found to be severely low (135 pg/mL). Supplementation with intramuscular cobalamin led to clear improvement in orientation and behavior. However, during a later deterioration, despite treatment, her clinical condition worsened and she ultimately died in intensive care.

CASE 03 :

A 52 year old woman with cerebellar meningioma underwent 30 radiotherapy sessions,one month after the final session, she developed acute confusion, behavioral disturbances, and fever (38°C). EEG showed nonspecific acute encephalitis; MRI revealed massive diffuse leukoencephalopathy. Laboratory studies demonstrated an inflammatory syndrome with elevated ESR and CRP and mild inflammatory anemia.

She received broad spectrum antibiotics, corticosteroids, and neuroleptics for agitation, with spectacular clinical improvement within five days. Follow up MRI confirmed complete resolution of white matter abnormalities. Two months later, vitamin B12 level measured 119 pg/mL. Cobalamin replacement further improved cognitive and behavioral function.

DISCUSSION :

The three cases illustrate distinct etiologies of encephalopathy-autoimmune and radiation induced-sharing overlapping features: acute confusion, psychiatric symptoms, possible seizures, steroid responsiveness, and evidence of demyelination. In all three patients, severe vitamin B12 deficiency was identified as an aggravating factor.

In Hashimoto encephalitis **(Cases 01 and 02),** autoimmune thyroid disease is known to correlate with higher prevalence of cobalamin deficiency, likely due to autoimmune gastritis, pernicious anemia, or increased metabolic requirement during myelin injury and repair. Vitamin B12 deficiency may worsen psychiatric and neurological symptoms, delay recovery, and contribute to relapses **[19-25].**

In post radiation encephalopathy **(Case 03),** early delayed radiation injury induces oligodendrocyte dysfunction, inflammatory changes, and transient demyelination. Vitamin B12 deficiency likely exacerbates these mechanisms.

The complete reversibility of white matter lesions after corticosteroids and subsequent clinical improvement after B12 supplementation support the hypothesis of a dual mechanism: inflammatory edema and metabolic vulnerability of myelin**[26,27].**

Cobalamin plays a crucial role in methylation processes, DNA synthesis, and myelin integrity. Deficiency produces neuropsychiatric syndromes, encephalopathy, gait disturbance, and reversible white matter lesions. Because vitamin B12 supplementation is safe, inexpensive, and potentially dramatically beneficial, routine screening is essential in any encephalopathy with inflammatory, autoimmune, or demyelinating features **[28,29].**

CONCLUSION :

These three cases demonstrate that vitamin B12 deficiency may coexist with, mimic, or exacerbate Hashimoto encephalitis and post radiation encephalopathy. Given the profound impact of cobalamin deficiency on the central nervous system, systematic evaluation of vitamin B12 levels is warranted in patients presenting with acute or subacute encephalopathy, particularly in autoimmune or post radiation contexts.

Early recognition and correction of deficiency may significantly improve neurological outcomes **[30-31].**

BIBLIOGRAPHY:

1. Lord Brain, Jellinek EH, Ball K. Hashimoto's disease and encephalopathy. Lancet 1966; ii: 512-4.

2. Shaw PJ, Wells TJ, Newman PK, Cleland PG, Cartlidge NEF. Hashimoto's encephalopathy: a steroid-responsive disorder associated with high anti-thyroid antibody titers – report of 5 cases. Neurology 1991; 41: 228-33.

3. Kothbauer-Margreiter I, Sturzenegger M, Komor J, Baumgartner R, Hess EW. Encephalopathy associated with Hashimoto thyroiditis: diagnosis and treatment. J Neurol 1996; 243: 585-93.

4. Crozier S, Kerstichel P, Masson C, Nys PM, Masson M. Encéphalopathie de Hashimoto corticodépendante. Presse Méd1994 ; 23 : 1400-1.12 Manto M, Goldman S, Bodur H. Syndrome cérébelleux associé à une encéphalopathie de Hashimoto. Rev Neurol 1996 ; 152 :202-4.

5. Engum A, Bjaro T, Mykletun A, et al. An association between depression, anxiety and thyroid doi:10.1097/MAJ.0b013e31815c3b5b. function–a clinical fact or an artefact? Acta Psychiatr Scand 2002; 106:27–34.

6. Samuels M. H. Thyroid disease and cognition. Endocrinology and Metabolism Clinics. 2014; 43(2):.

7. Giynas Ayhan M, Uguz F, Askin R, Gonen MS. The prevalence of depression and anxiety disorders in patients with euthyroid Hashimoto's thyroiditis: a comparative study. Gen Hosp Psychiatry. 2014;

8. Jellinek E.H., Kelly R.E. Cerebellar syndrome in myxoedema. The Lancet 1960; 2(7144): 225–227.

9. Holmes JM. Cerebral manifestations of vitamin B12 deficiency. Br Med J 1956;152:1394–8.

10. Healton EB, Savage DG, Brust JC, Garret TJ, Lindenbaum J. Neurologic aspects of cobalamin deficiency. Med1991;70:229–45.

11. Collins et Pawlak, « Prevalence of Vitamin B-12 Deficiency among Patients with Thyroid Dysfunction ». Doi10.6133/apjcn.2016.25.2.22

12. Lippi G, Montagnan M, Targher G, Salvagno GI, Guidi GC. Prevalence of folic acid and vitamin B12 deficiencies in patients with thyroid disorders. Am J Med Sci. 2008;336:50–52. doi:10.1097/MAJ.0b013e31815c3b5b.

13. Lahner E, Centanni M, Agnello G, Vannella L, Ianonni C, Delle Fave G, et al. Occurrence and risk factors for autoimmune thyroid disease in patients with atrophic body gastritis. Am J Med. 008;121:136-141. doi: 10.1016/j.

14. Barker R, Zajacek J, Wilkinson I. Thyrotoxic Hashimoto's encephalopathy. J Neurol Neurosurg Psychiatry 1996 ; 60 : 234.

15. Sanders V. Neurologic manifestations of myxedema. N Engl J Med 1962 ; 266 : 547-52.
16. Castillo, P., Woodruff, B., Caselli, R., Vernino, S., Lucchinetti, C., Swanson, J., Noseworthy, J., Aksamit, A., Carter, J., Sirven, J., Hunder, G., Fatourechi, V., Mokri, B., Drubach, D., Pittock, S., Lennon, V., Boeve, B. Steroid-responsive encephalopathy associated with autoimmune thyroiditis. Arch. Neurol. 2006; 63: 197–202.

17. Andrès E, Loukili NH, Noel E, Kaltenbach G, Ben Abdelgheni M, Perrin AE, et al. Vitamin B12 (cobalamin) deficiency in elderly patients. CAMJ 2004;171:251–60.

18. Vitamin B12 Deficiency in Type 2 Diabetes Mellitus. Carlos Tavares BELLO Acta Med Port 2017 Oct;30(10):719-726 https://doi.org/10.20344/amp.8860

19. Vitamin B12, demyelination, remyelination and repair in multiple sclerosis Ariel Miller, Maya Korem, Ronit Almog, Yanina Galboiz 0022-510X/$ - see front matter D 2005 Elsevier B.V. All rights reserved. doi:10.1016/j.jns.2005.03.009

20. Vitamin b12 and vitamin d levels in patients with autoimmune hypothyroidism and their Correlation with the antithyroid peroxidase antibodies Aktaş ş.h. Issn: 1011-7571 (print), eissn: 1423- 0151 (online) Https://www.karger.com/mpp Medical principles and practice

21. Stabler SP, Allen RH, Savage DG, Lindenbaum J. Clinical spectrum and diagnosis of cobalamin deficiency. Blood 1990;76:871–81.

22. Andrès E, Renaux V, Campos F, Opre´a C, Sonntag-Fohrer C, Warter J, et al. Troubles neurologiques isolés reévélant une maladie de Biermer chez le sujet jeune. Rev Med Interne. 2001;22:389–93.

23. Ferracci F, Carnevale A: The neurological disorder associated with thyroid autoimmunity. J Neurol 2006, 253(8):975 – 984.

24. Tang et al.: Hashimoto's encephalopathy cases: Chinese experience. BMC Neurology 2012 12:60.

25. Misra UK, Kalita J. Comparison of clinical and electrodiagnostic features in vitamin B12 deficiency neurological syndromes with and without antiparietal cell antibodies. Postgrad Med J 2007;83:124–7.

26. Andrès E, Goichot B, Schlienger JL. Food-cobalamin malabsorption: a usual cause of vitamin B12 deficiency. Arch Intern Med 2000;161: 2060 – 1.

27. Churilov LP, Sobolevskaia PA, Stroev YI, Thyroid Gland And Brain: Enigma Of Hashimoto's Encephalopathy, Best Practice & Research Clinical Endocrinology & Metabolism, https://doi.org/10.1016/j.beem.2019.101364.

28. Miller, Vitamin B12, demyelination, remyelination and repair in multiple sclerosis 0022-510X/$ - see front matter D 2005 Elsevier B.V. All rights reserved. doi:10.1016/j.jns.2005.03.009

29. Complications neurologiques de la radiothérapie. Available from EM-Consulte.

30. UpToDate. Acute complications of cranial irradiation.

31. Modern Radiotherapy-Induced Neurotoxicity Mechanisms. Cancers. 2024;16(21):3571.