

CASE REPORT

PEER REVIEWED | OPEN ACCESS

Subacute combined degeneration: When neuroimaging complements the clinic—A case report

Daniel Antunes Pereira, Angélica Sabino Pereira Rodrigues,
Gilberto Canedo M Jr, Valéria Camargo Silveira,
Marco Antônio Orsini Neves, Antonio Marcos da Silva Catharino

ABSTRACT

Introduction: Low serum B vitamin levels are potentially causally related to these prevalent mental symptoms. Because of this, cobalamin—vitamin B12—is crucial for producing myelin and neurotransmitters. Additionally, subacute combined degeneration (SCD) is one of the consequences of B12 deficiency. Symptomatology often is paraplegia, spasticity, and contractures which are typically progressive. In addition, as the disease advances, they experience a distal sensorimotor loss that ascends proximally and causes spastic quadriparesis and generalized hypoaesthesia.

Case Report: Male, 33 years old, with a history of a fall in December 2015, when pain and discomfort started in the left lower limb. A year ago, she evolved

with paraparesis, loss of sphincter control, sensory changes in the extremities of the limbs and sensory level at T10, in addition to a report of visual disturbance in the left eye. At that time, the dosage of vitamin B12 was very low—50 pg/mL (reference above 300 pg/mL). On physical examination: extrapyramidal syndrome with hypoaesthesia at the distal level. Bilateral Hoffmann's sign, spastic paraparesis, hyperreflexia in the lower limbs, clonus in the feet, and loss of sphincter control. Sensitive level at T10. Magnetic resonance imaging (MRI) showed cervical dorsal lumbar spinal cord and cone with hypersignal focus on the lateral and posterior cords and skull hypersignal focus in the topography of the corticospinal tracts, suggestive of combined subacute degeneration.

Conclusion: Vitamin B12 deficiency, in addition to other pathologies, is also found in SCD. When treated early, these alterations found in the imaging exam can be resolved without signs of atrophy. Thus, neuroimaging plays a relevant role in the diagnosis, complementing the clinic.

Keywords: Subacute combined degeneration, Spinal cord degeneration, Vitamin B12 deficiency

How to cite this article

Pereira DA, Rodrigues ASP, Gilberto CM Jr, Silveira VC, Neves MAO, da Silva Catharino AM. Subacute combined degeneration: When neuroimaging complements the clinic—A case report. *Int J Case Rep Images* 2023;14(2):118–122.

Article ID: 101423Z01DP2023

doi: 10.5348/101423Z01DP2023CR

Daniel Antunes Pereira¹, Angélica Sabino Pereira Rodrigues¹, Gilberto Canedo M Jr², Valéria Camargo Silveira³, Marco Antônio Orsini Neves⁴, Antonio Marcos da Silva Catharino⁵

Affiliations: ¹Medical student at Iguaçú University, UNIG/RJ, Nova Iguaçú - RJ, Brazil; ²Professor of Neurology - Universidade Iguaçú - UNIG-RJ, Nova Iguaçú - RJ; Physician of the Neurology Service of Nova Iguaçú General Hospital, Nova Iguaçú, RJ, Brazil; ³Professor of Neurology at the University of Iguaçú and Physician at the General Hospital of Nova Iguaçú, RJ, Brazil; ⁴Physician, Neurologist, Adjunct Professor of Medicine at Universidade Iguaçú - UNIG/Nova Iguaçú, RJ, Brazil; ⁵Department of Neurology of Hospital Geral de Nova Iguaçú, PhD student in Neurology at the Federal University of the State of Rio de Janeiro - UNIRIO, Adjunct Professor of Medicine at Iguaçú University - UNIG/Nova Iguaçú, RJ, Brazil.

Corresponding Author: Antonio Marcos da Silva Catharino, Rua Gavião Peixoto 70, Room 811, CEP 24.2230-100, Icaraí, Niterói-RJ, Brazil; Email: catharino.antonio@gmail.com

Received: 17 April 2023
Accepted: 16 October 2023
Published: 13 November 2023

INTRODUCTION

For the human body, vitamins are crucial elements. In all functions and systems of our body, they influence various processes, such as the development of the central nervous system in the child. And vitamin B12 is one of the essential nutrients that people need. It is prevalent in a variety of animal protein foods [1, 2].

Low serum B vitamin levels are potentially causally related to these prevalent mental symptoms. Because of this, vitamin B12 is crucial for producing myelin and neurotransmitters. Enteral malabsorption is the main reason for low serum levels of vitamin B12, particularly in older people due to gastric atrophy [3, 4].

Additionally, subacute combined degeneration (SCD) is one of the consequences of B12 deficiency. The dorsal columns and lateral corticospinal tracts exhibit myelinolytic lesions in SCD caused by severe vitamin B12 deficiency [5, 6].

Symptomatology often is paraplegia, spasticity, and contractures are typically progressive. In addition, as the disease advances, they experience a distal sensorimotor loss that ascends proximally and causes spastic quadriparesis and generalized hypoesthesia [7].

In more severe cases, it has been reported that other central nervous system structures like the cerebellum and cerebrum are involved. On T2-weighted images, magnetic resonance imaging (MRI) in patients with clinically suspected SCD may reveal increased signal intensity involving the posterior and lateral spinal cord white matter columns. Most frequently and severely affected are the cervical and upper thoracic cords [3, 8].

Time to diagnosis was also considered an important factor because delays in diagnosis of more than six months were linked to permanent neurological deficits [5].

A recent systematic review that compared the length of the B12 replacement intervention and the severity of the pathology produced intriguing findings regarding the prognosis of these patients. 89% of people who can walk unaided fully recover, compared to 50% who can walk with assistance, and 6% who require a wheelchair. This suggests that individuals with less severe spinal cord myelinolysis may have a better prognosis after beginning B12 replacement [4].

CASE REPORT

Male, 33 years old, with a history of a fall in December 2015, when pain and discomfort started in the left lower limb. A year ago, he evolved with paraparesis, loss of sphincter control, sensitive alteration in limb extremities, and sensitive level in T10, as well as the report of visual disturbance in the left eye. At this time, the laboratory dosage of vitamin B12 was significantly reduced.

On physical examination: extrapyramidal syndrome with hypoesthesia distal level. Sensitive in T10. Bilateral Hoffmann sign, spastic paraparesis, hyperreflexia in the lower limbs, clonus in the feet, and loss of sphincter control.

Magnetic resonance imaging of cervical spine with hypersignal focus in the lateral (corticospinal tracts) and posterior columns (Figure 1 and Figure 2).

Cranial MRI focuses on hypersignal in the topography of the corticospinal tracts, suggesting subacute combined degeneration (Figures 3 and 4).

Visual evoked potential with alteration of amplitude and latency in the left eye-suggestive of initial injury in optical pathways cerebrospinal fluid (CSF) study with slight hyperproteinorachia and signal increase in lactate levels.

Electroneuromyography (ENMG) preganglionic impairment suggests polyradiculoneuritis, with no signs of current denervation.

After correlating the clinical with neuroimaging, cyanocobalamin supplementation 5000 mcg intramuscularly 1x/week for eight weeks was started, with substantial improvement already at the beginning of treatment. Subsequently, continued therapy with a dosage of 5000 mcg intramuscularly 1x/month.



Figure 1: Cervical MRI—sagittal view—Presentation of elongated areas of hyperintense signal on T2.

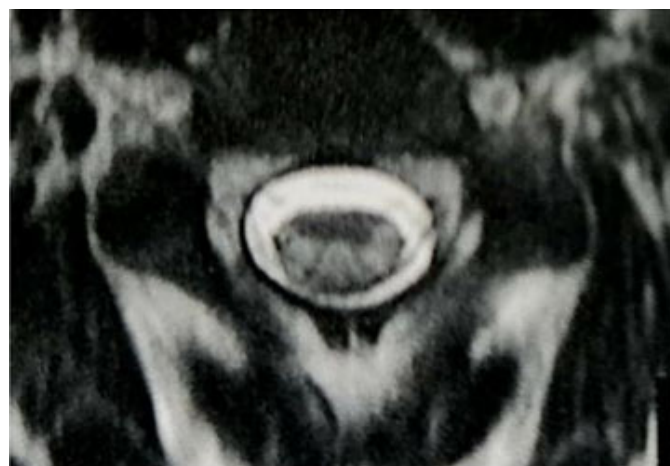


Figure 2: Cervical MRI—axial view—Presentation of hyperintense signal on T2 at dorsal columns and lateral corticospinal tracts.

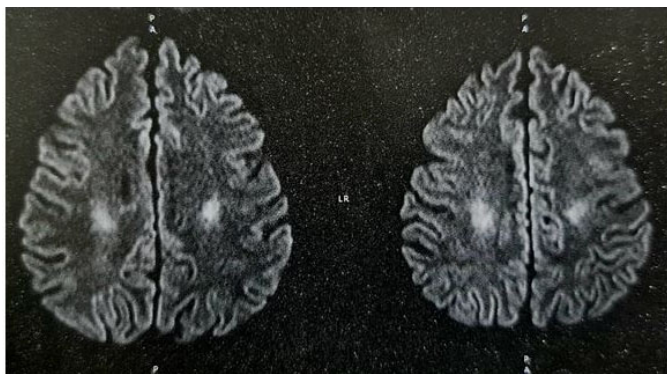


Figure 3: Brain MRI—axial view—The hyperintense signal on FLAIR compromises the periventricular white matter, which may correspond to a decrease in myelin.

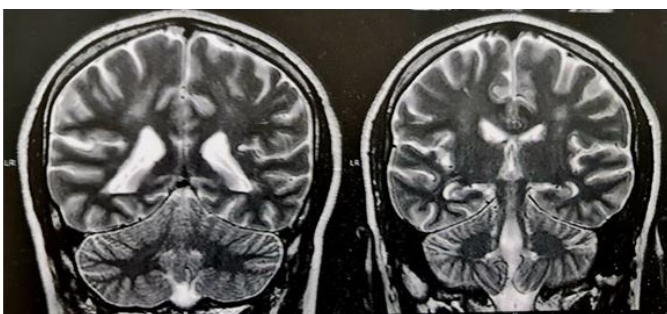


Figure 4: Brain MRI—coronal view—The hyperintense signal on T2 compromises the periventricular white matter, which may correspond to a decrease in myelin.

DISCUSSION

Subacute combined medullary degeneration should be part of the radiological differential diagnosis of demyelinating central nervous system lesions. Even so, as there are few case reports, it needs to be included in the register of differential diagnoses of demyelinating lesions. As we can observe in the case report, in the magnetic resonance of the skull, we have a hypersignal in T2 and FLAIR, showing involvement of the periventricular white matter, which corresponds to a decrease, an impairment of the myelin sheath [9–12].

The symptomatology presented by the patient clearly demonstrated an extrapyramidal syndrome with a sensitive level. Due to her history of falls, there was a diagnostic hypothesis relating the patient's clinic to the trauma suffered. There are no reports in the literature dealing with any correlation between subacute combined medullary degeneration after traumatic injuries; therefore, there is great importance on a thorough neurological examination and targeted complementary exams. As in this case, the dosage of vitamin B12 and the neuroimaging findings confirmed the diagnostic hypothesis [10, 13].

Clinical aspects and MRI findings in patients with SCD showed a predominance of involvement of the cervical spinal cord, followed by involvement of the thoracic spinal

cord with simultaneous involvement of both segments. Cranial MRI allows the observation of radiological alterations in the pyramidal tract, probably caused by hypovitaminosis B12. In the anatomopathological study, edema of the myelin sheath is observed at the onset of hypovitaminosis; on microscopy, destruction of myelin and axons in the white matter ensues, segmentally at the mid-thoracic level, causing vacuoles. The most affected region is the posterior cervical and thoracic spinal cord. The morphological study of the medulla showed involvement of the lateral and anterior corticospinal tracts and the spinothalamic tract. With increasing vitamin deficiency, axons decline in ascending lots of the posterior bundle and the descending pyramidal tracts. The most common clinical picture is spastic paraparesis, usually with no identified sensory level, hypoesthesia or reduced vibration sensitivity, loss of segmental position sensation, and possibly related bilateral symmetrical distal sensory polyneuropathy. The isolated involvement of one or the other tract can occur in different clinical situations (multiple sclerosis, neoplasms); the combined degeneration of both is characteristic of vitamin B12 deficiency, leading to the designation of this condition as subacute combined degeneration of the spinal cord [11, 12].

Interestingly, a recent study grouped 68 patients with subacute combined degeneration and followed them for six months. This study concluded that anemia, vitamin B12 deficit, and spinal cord MRI abnormalities are associated with worse clinical manifestations [14].

Magnetic resonance imaging can reveal areas of demyelination in the brain or spinal cord, representing areas of hyperintensity on T2-weighted sequences. This finding is most often found in the posterior medulla of the spinal cord. Radiological changes may take up to 12 months to disappear [12].

Therefore, although the clinic and the B12 dosage suggest the diagnosis, it was through neuroimaging that this hypothesis was confirmed, ruling out any differential diagnosis related to the trauma reported by the patient. Furthermore, a recent retrospective study reported cases in which the serum B12 level was normal or even elevated, and the altered neuroimaging, together with the patient's clinical condition, confirmed the diagnosis [15].

CONCLUSION

Vitamin B12 deficiency and other pathologies are also found in subacute combined degeneration due to the injury in the myelin sheath, which becomes reversible with early diagnosis and treatment. In the magnetic resonance, we can observe the involvement of the cervical, thoracic, and brain spinal cord, corresponding to a decrease in the myelin sheath. These alterations found in the imaging exam, when treated early, can be resolved without signs of atrophy. Thus, neuroimaging plays a relevant role in the diagnosis, complementing the clinic.

A case study should be carried out, with an in-depth follow-up should also be carried out, as it is a problem that is sometimes asymptomatic and has irreversible conditions for the patient. Any sign or symptom that the patient presents related to hypovitaminosis B12 must be treated to reach desirable levels without causing problems for the patient's health.

REFERENCES

1. Hasbaoui BE, Mebrouk N, Saghir S, Yajouri AE, Abilkassem R, Agadr A. Vitamin B12 deficiency: Case report and review of literature. *Pan Afr Med J* 2021;38:237.
2. Obeid R, Heil SG, Verhoeven MMA, van den Heuvel EGHM, de Groot LCPGM, Eussen SJPM. Vitamin B12 intake from animal foods, biomarkers, and health aspects. *Front Nutr* 2019;6:93.
3. Jain KK, Malhotra HS, Garg RK, Gupta PK, Roy B, Gupta RK. Prevalence of MR imaging abnormalities in vitamin B12 deficiency patients presenting with clinical features of subacute combined degeneration of the spinal cord. *J Neurol Sci* 2014;342(1–2):162–6.
4. Jhunjhnuwala D, Tanglay O, Briggs NE, Yuen MTY, Huynh W. Prognostic indicators of subacute combined degeneration from B12 deficiency: A systematic review. *PM R* 2022;14(4):504–14.
5. Check L, Abdelsayed N, Figueroa G, Rangunathan A, Faris M. Subacute combined degeneration of the cervical spine secondary to inhaled nitrous-oxide-induced cobalamin deficiency. *Cureus* 2022;14(1):e21214.
6. Omotosho YB, Ying GW, Orji R, Patel H. Recreational nitrous oxide-induced subacute combined degeneration. *Cureus* 2022;14(3):e23409.
7. Rabhi S, Maaroufi M, Khibri H, et al. Magnetic resonance imaging findings within the posterior and lateral columns of the spinal cord extended from the medulla oblongata to the thoracic spine in a woman with subacute combined degeneration without hematologic disorders: A case report and review of the literature. *J Med Case Rep* 2011;5:166.
8. Lim CCT. Neuroimaging in postinfectious demyelination and nutritional disorders of the central nervous system. *Neuroimaging Clin N Am* 2011;21(4):843–58, viii.
9. Martins JT, Carvalho-Silva M, Streck EL. Effects of vitamin B12 deficiency on the brain. *Revista Inova Saúde, Criciúma* 2017;6(1).
10. Paniz C, Grotto D, Schmitt GC, et al. Physiopathology of vitamin B12 deficiency and its laboratorial diagnosis. *J Bras Patol Med Lab* 2005;41(5).
11. Srikanth SG, Jayakumar PN, Vasudev MK, Taly AB, Chandrashekar HS. MRI in subacute combined degeneration of spinal cord: A case report and review of literature. *Neurol India* 2002;50(3):310–2.
12. Silva MT, Cavalcanti JL, Moreira DM. Neuroradiological features of the brain in subacute combined spinal cord degeneration: Case report. [Article in Portuguese]. *Arq Neuropsiquiatr* 2000;58(3A):752–5.

13. Saji AM, De Jesus O. Spinal Cord Subacute Combined Degeneration. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; 2023.
14. Cao J, Su ZY, Xu SB, Liu CC. Subacute combined degeneration: A retrospective study of 68 cases with short-term follow-up. *Eur Neurol* 2018;79(5–6):247–55.
15. Li J, Ren M, Dong A, et al. A retrospective study of 23 cases with subacute combined degeneration. *Int J Neurosci* 2016;126(10):872–7.

Author Contributions

Daniel Antunes Pereira – Conception of the work, Design of the work, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Angélica Sabino Pereira Rodrigues – Conception of the work, Design of the work, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Gilberto Canedo M Jr – Conception of the work, Design of the work, Acquisition of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Valéria Camargo Silveira – Conception of the work, Design of the work, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Marco Antônio Orsini Neves – Conception of the work, Interpretation of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Antonio Marcos da Silva Catharino – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Guarantor of Submission

The corresponding author is the guarantor of submission.

Source of Support

None.

Consent Statement

Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

Copyright

© 2023 Daniel Antunes Pereira et al. This article is distributed under the terms of Creative Commons Attribution License which permits unrestricted use, distribution and reproduction in any medium provided the original author(s) and original publisher are properly credited. Please see the copyright policy on the journal website for more information.

Access full text article on
other devices



Access PDF of article on
other devices





Submit your manuscripts at
www.edoriumjournals.com

