

Severe parkinsonism
associated with anti-CRMP5
antibody-positive
paraneoplastic neurological
syndrome and abnormal
signal intensity in the bilateral
basal ganglia

INTRODUCTION

Anticollapsin response mediator protein 5 antibody (anti-CRMP5 antibody, also known as anti-CV2 antibody) is usually

PostScript

associated with small-cell lung carcinoma (SCLC) or thymoma.¹ Although optic neuropathy, cerebellar ataxia and chorea are considered typical clinical features of paraneoplastic neurological syndrome (PNS) associated with anti-CRMP5 antibody, the neurological involvement of anti-CRMP5 antibody is broader.¹ We report the first known case with anti-CRMP5 antibody-associated PNS presenting with predominant parkinsonism and bilateral signal abnormalities in the caudate and putamen on brain MRI.

CASE REPORT

A 72-year-old man presented with a 6-month history of ambulatory disturbance. After the patient noticed sialorrhoea in September 2010, he began to develop a stooped posture, and short-stepped and propulsive gait. In January 2011, he noted gradual onset of dysarthria and constipation. His gait instability became severe, and by April 2011, he was only able to walk with assistance. He reported to our hospital in May 2011. On neurological examination, he was alert and communicative. His speech consisted of a low monotonous voice. Although he had marked bradykinesia and exhibited facial masking, no rigidity or tremor was observed. He shuffled when he walked with assistance, had a stooped posture and his arm swing was decreased bilaterally. Severe postural impairment was noted on the pulling test. Brain MRI showed bilateral lesions in the lenticular and caudate nuclei, which were hyperintense on T2-weighted images and fluid-attenuated inversion recovery images, and hypointense on T1-weighted images (figure 1A–C).

The differential diagnoses included infective pathology such as HIV and Japanese encephalitis virus, inflammatory demyelination, genetic metabolic causes, intoxication and neurodegeneration. The following tests were normal or negative: full blood count, C reactive protein, liver and renal function tests, HIV1 and 2 tests, syphilis serology, copper studies and anti-nuclear antibody tests. A serum study showed high concentrations of progastrin releasing peptide and neuron-specific enolase (413 and 46.4 ng/mL, respectively), and a truncal CT scan revealed a small lung nodule and swollen lymph nodes in the mediastinum (figure 1G, H). The patient underwent a lymph node biopsy, and the pathology was compatible with SCLC (figure 1I, J). Serum and cerebrospinal fluid studies showed a high titre of anti-CRMP5 antibodies; cerebrospinal fluid examination was otherwise unremarkable. Other paraneoplastic markers including anti-Hu antibody, anti-Yo antibody,

anti-Ri antibody, anti-Tr antibody, anti-Ma2 antibody and anti-amphiphysin antibody were negative. Based on the recommended diagnostic criteria for PNS, we diagnosed this patient as definite PNS with non-classical symptoms, SCLC, and positive for an onconeural antibody.²

Three courses of chemotherapy with etoposide and carboplatin were performed followed by radiation therapy, producing partial tumour shrinkage (figure 1K, L). This therapy also partially reduced the abnormal signal intensity on the brain MRI (figure 1D–F). Although L-dihydroxyphenylalanine (L-DOPA) treatment (300 mg/day) did not alleviate the patient's gait freezing, he became ambulatory with assistance after the chemoradiation therapy. During the follow-up period of 4 years and 1 month, he has shown no recurrence of severe parkinsonism.

DISCUSSION

PNS is a heterogeneous group of neurological disorders caused by mechanisms other than tumour metastases, metabolic and nutritional deficits, infections, coagulopathy or side effects of cancer treatment. This syndrome may affect any part of the nervous system from the cerebral cortex to neuromuscular junctions and muscles, and may damage one area such as Purkinje cells or presynaptic cholinergic synapses, or multiple areas presenting as encephalomyelitis. Although the pathogenesis of PNS is incompletely understood, immunological factors are believed to be important because autoantibodies and T-cell responses against nervous system antigens have been described for PNS.

Golbe *et al*³ reported the first case of paraneoplastic parkinsonism with metastatic carcinoma of the breast in a patient who rapidly developed parkinsonian signs and symptoms. Similar to our case, this patient did not respond to typical Parkinson's disease medications (ie, L-DOPA). No autoantibodies were found in the serum of the patient described by Golbe *et al*, and the patient ultimately succumbed despite chemotherapy. Other groups reported several cases of autoantibody-mediated parkinsonism, including cases positive for anti-Ri⁴ and voltage-gated potassium channel⁵ antibodies.

To our knowledge, this is the first documented case of anti-CRMP5 antibody-positive PNS characterised by severe parkinsonism and bilateral signal abnormalities in the basal ganglia on brain MRI. Some reports have described anti-CRMP5 antibody-positive patients who presented with parkinsonism in whom the underlying mechanisms were unclear.¹ In our case,

brain MRI suggests that parkinsonism associated with anti-CRMP5 antibodies may be caused by basal ganglia dysfunction. In support of this hypothesis, several cases have been reported of patients with anti-CRMP5 antibody-positive PNS who presented with chorea associated with signal abnormalities in the basal ganglia.⁶ As CRMP5 has not been reported to be expressed on the surface of basal ganglia cells,⁷ we do not know the exact reason why our patient exhibited bilateral abnormal intensity in the basal ganglia on brain MRI.

We have not administered any kind of immunomodulatory therapies to this patient because no strong evidence exists to indicate starting immunomodulation therapy for the treatment of PNS, and also because the best way to stabilise PNS is to treat the cancer as soon as possible.^{8–9} Indeed, PNS patients who have antibodies against cytoplasmic neuronal antigens such as CRMP5 do not improve with immunomodulation therapy.^{9–10} Furthermore, we were concerned that simultaneous use of immunosuppressive therapies and oncological treatments may result in increased toxicity.⁹ In our case, before starting chemoradiation therapy against SCLC, we treated the patient with L-DOPA to mitigate his parkinsonism, but no obvious effect was observed. We speculate that the reason for this failure is that basal ganglia postsynaptic neurons, which express dopamine receptors on the surface, are probably impaired by T cell-mediated cytotoxicity.¹⁰ This speculation is consistent with the findings of brain MRI in our patient.

In summary, we describe the first case presenting with severe parkinsonism associated with anti-CRMP5 antibody positivity and bilateral abnormal intensity in the basal ganglia on brain MRI.

Satoru Tada,^{1,2} Mitsuru Furuta,³ Kei Fukada,² Daisuke Hirozawa,⁴ Misa Matsui,⁵ Futoshi Aoike,⁶ Tatsusada Okuno,³ Jin-ichi Sawada,² Hideki Mochizuki,³ Takanori Hazama²

¹INSERM UMR1169 CEA/MIRCen, Fontenay aux Roses, France

²Department of Neurology, Osaka General Medical Center, Osaka, Japan

³Department of Neurology, Osaka University Graduate School of Medicine, Suita, Japan

⁴Department of Neurology, Shizuoka Institute of Epilepsy and Neurological Disorders, National Hospital Organization, Shizuoka, Japan

⁵Department of Neurology, National Toneyama Hospital, National Hospital Organization, Toyonaka, Japan

⁶Department of Neurology, Tane General Hospital, Osaka, Japan

Correspondence to Dr Kei Fukada, Department of Neurology, Osaka General Medical Center, 3-1-56, Bandaihigashi, Sumiyoshi-ku, Osaka 558-8558, Japan; fukada@gh.opho.jp

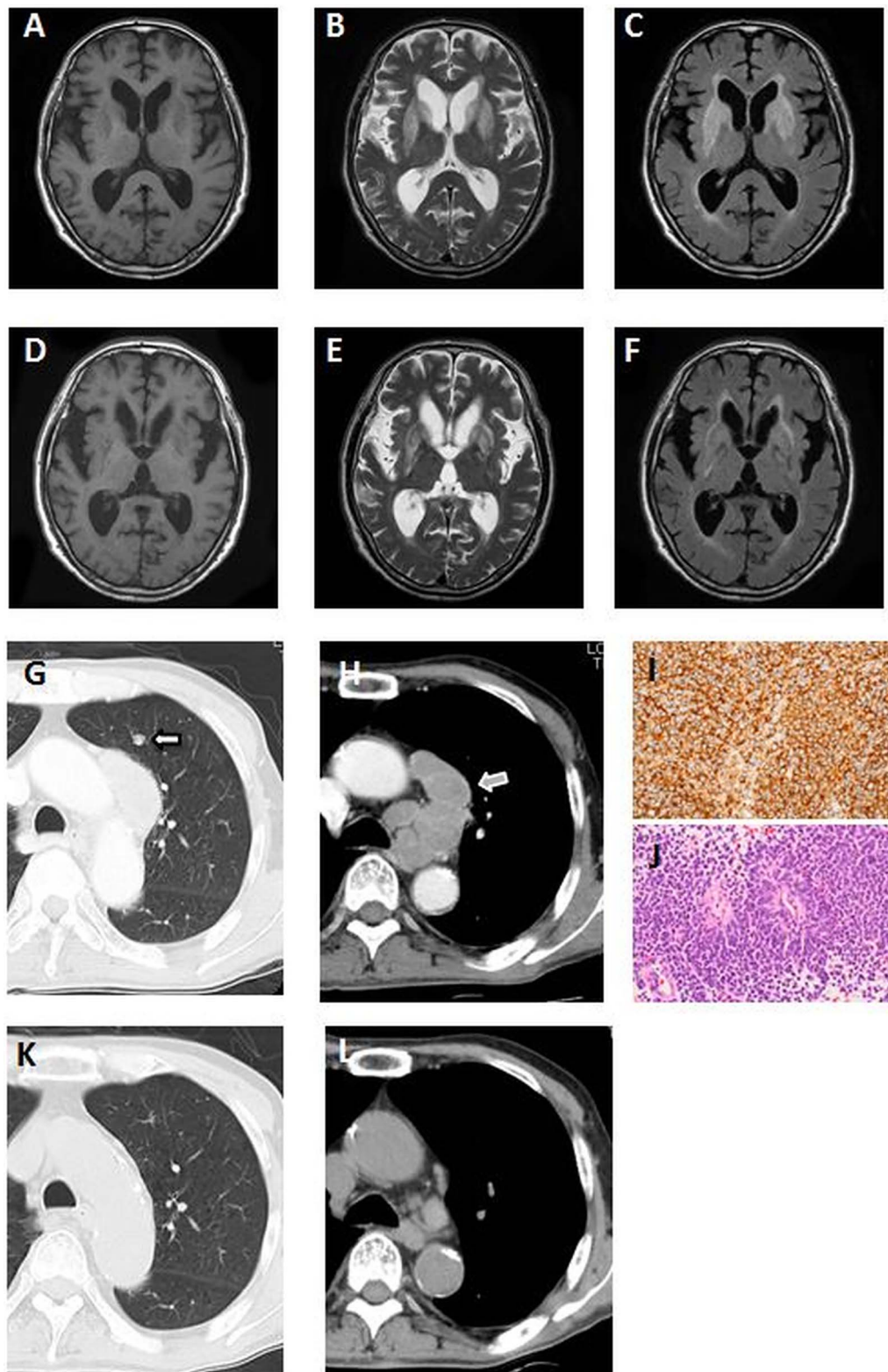


Figure 1 Axial T1-weighted, T2-weighted and fluid-attenuated inversion recovery image of the brain demonstrated symmetrical abnormal intensity of the putamen and caudate nuclei (A–C). Chemotherapy and radiotherapy aimed at treating the small-cell lung carcinoma (SCLC) partially ameliorated the abnormal signal intensity on the brain MRI (D–F). Lung CT with contrast injection revealed a nodule in the left anterior part of the lung (white arrow) (G) and swollen lymph nodes in the mediastinum (grey arrow) (H). The tumour was a SCLC. (I) Immunohistochemical analysis of the lymph nodes in the mediastinum with anti-CD56 antibodies and (J) H&E staining. Chemotherapy and radiotherapy produced a partial response in the nodule (K) and the lymph nodes (L). Original magnification of I and J, $\times 100$.

PostScript

Acknowledgements The authors thank Professor Keiko Tanaka, Kanazawa Medical University, for the measurement of paraneoplastic anti-neuronal antibodies.

Contributors ST, KF, TO and HM wrote the manuscript. MF, KF, DH, MM, FA, J-IS and TH cared for the patient. All the authors contributed to writing the final version of the paper.

Funding This case report is partially supported by grants from JAPAN Agency for Medical Research and Development, AMED.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.



OPEN ACCESS

Open Access This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>



CrossMark

To cite Tada S, Furuta M, Fukada K, *et al.* *J Neurol Neurosurg Psychiatry* 2016;**87**:907–910.

Received 19 June 2015

Revised 12 August 2015

Accepted 26 August 2015

Published Online First 15 September 2015

J Neurol Neurosurg Psychiatry 2016;**87**:907–910.

doi:10.1136/jnnp-2015-311569

REFERENCES

- 1 Yu Z, Kryzer TJ, Griesmann GE, *et al.* CRMP-5 neuronal autoantibody: marker of lung cancer and thymoma-related autoimmunity. *Ann Neurol* 2001;49:146–54.
- 2 Graus F, Delattre JY, Antoine JC, *et al.* Recommended diagnostic criteria for paraneoplastic neurological syndromes. *J Neurol Neurosurg Psychiatry* 2004;75:1135–40.
- 3 Golbe LI, Miller DC, Duvoisin RC. Paraneoplastic degeneration of the substantia nigra with dystonia and parkinsonism. *Mov Disord* 1989;4:147–52.
- 4 Pittock SJ, Lucchinetti CF, Lennon VA. Anti-neuronal nuclear autoantibody type 2: paraneoplastic accompaniments. *Ann Neurol* 2003;53:580–7.
- 5 Tan KM, Lennon VA, Klein CJ, *et al.* Clinical spectrum of voltage-gated potassium channel autoimmunity. *Neurology* 2008;70:1883–90.
- 6 Vigliani MC, Honnorat J, Antoine JC, *et al.* Chorea and related movement disorders of paraneoplastic origin: the PNS EuroNetwork experience. *J Neurol* 2011;258:2058–68.
- 7 Bretin S, Reibel S, Charrier E, *et al.* Differential expression of CRMP1, CRMP2A, CRMP2B, and CRMP5 in axons or dendrites of distinct neurons in the mouse brain. *J Comp Neurol* 2005;486:1–17.
- 8 Honnorat J, Antoine JC. Paraneoplastic neurological syndromes. *Orphanet J Rare Dis* 2007;2:22.
- 9 Rosenfeld MR, Dalmau J. Diagnosis and management of paraneoplastic neurologic disorders. *Curr Treat Options Oncol* 2013;14:528–38.
- 10 Honnorat J. Early-onset immunotherapy by intravenous immunoglobulin and corticosteroids in well characterized onconeural-antibody-positive paraneoplastic neurological syndrome. *Clin Exp Immunol* 2014;178(Suppl 1):127–9.



Severe parkinsonism associated with anti-CRMP5 antibody-positive paraneoplastic neurological syndrome and abnormal signal intensity in the bilateral basal ganglia

Satoru Tada, Mitsuru Furuta, Kei Fukada, Daisuke Hirozawa, Misa Matsui, Futoshi Aoike, Tatsusada Okuno, Jin-ichi Sawada, Hideki Mochizuki and Takanori Hazama

J Neurol Neurosurg Psychiatry 2016 87: 907-910 originally published online September 15, 2015
doi: 10.1136/jnnp-2015-311569

Updated information and services can be found at:
<http://jnnp.bmj.com/content/87/8/907>

These include:

References

This article cites 10 articles, 1 of which you can access for free at:
<http://jnnp.bmj.com/content/87/8/907#BIBL>

Open Access

This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

Email alerting service

Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections

Articles on similar topics can be found in the following collections
[Open access](#) (214)

Notes

To request permissions go to:
<http://group.bmj.com/group/rights-licensing/permissions>

To order reprints go to:
<http://journals.bmj.com/cgi/reprintform>

To subscribe to BMJ go to:
<http://group.bmj.com/subscribe/>