



Orbital IgG4 Disease: Imaging Findings on ⁶⁸Ga-DOTANOC PET/CT

Saurabh Arora¹ · Nishikant A. Damle¹ · Rachna Meel² · Sanjay Sharma³ · Seema Sen⁴ · Chandrasekar Bal¹ · Kanak Lata¹ · Sneha Prakash^{1,5} · Divya Yadav¹ · Meivel Angamuthu¹

Received: 29 April 2019 / Revised: 30 August 2019 / Accepted: 4 September 2019 / Published online: 25 October 2019
© Korean Society of Nuclear Medicine 2019

Abstract

Immunoglobulin G4 (IgG4)-related diseases are a spectrum of systemic inflammatory conditions of unknown etiology, which are characterized by infiltration of tissues by IgG4 plasma cells and sclerosing inflammation (Cheuk and Chan *Adv Anat Pathol* 17:303–32, 2010). Although this condition was initially described in relation to autoimmune pancreatitis, now it has been reported in almost every organ system of body (Zen and Nakanuma *Am J Surg Pathol* 34:1812–9, 2010, Masaki et al. *Ann Rheuma Dis* 68:1310–5, 2009). Orbital involvement by IgG4 disease can involve extraocular muscles (EOM), lacrimal glands, conjunctiva, eyelids, infraorbital nerve, orbital fat, and nasolacrimal system (McNab and McKelvie. *Ophthal Plast Reconstr Surg* 31:167–78, 2015, Katsura et al. *Neuroradiology* 54:873–82, 2012). The basis of using ⁶⁸Ga-DOTANOC PET/CT in IgG4 orbital disease is the known expression of somatostatin receptors in chronic inflammatory cells (Cuccurullo et al. *Indian J Radiol Imaging* 27:509-16, 2017) and also avidity shown previously in other IgG4-related diseases (Cheng et al. *Clin Nucl Med* 43:773-6, 2018).

Keywords Orbital IgG4 disease · Somatostatin receptors · ⁶⁸Ga-DOTANOC PET/CT

✉ Nishikant A. Damle
nkantdamle@gmail.com

Saurabh Arora
docsaurabharora@gmail.com

Rachna Meel
dr.rachnameel@gmail.com

Sanjay Sharma
drssharma@hotmail.com

Seema Sen
drseemasen@gmail.com

Chandrasekar Bal
csbal@hotmail.com

Kanak Lata
kanaklata777@gmail.com

Sneha Prakash
sneha.4teen@gmail.com

Divya Yadav
mynamedivya.1991@gmail.com

Meivel Angamuthu
drmeivel@gmail.com

¹ Department of Nuclear Medicine, All India Institute of Medical Sciences, New Delhi 110029, India

² Department of Ophthalmology, All India Institute of Medical Sciences, New Delhi 110029, India

³ Department of Radio-diagnosis, All India Institute of Medical Sciences, New Delhi 110029, India

⁴ Department of Ocular Pathology, All India Institute of Medical Sciences, New Delhi 110029, India

⁵ All India Institute of Medical Sciences, New Delhi 110029, India



Fig. 1 The maximum intensity projection (MIP) image of ^{68}Ga -DOTANOC PET/CT scan done in a 50-year-old male patient who presented with protrusion of bilateral eyeballs and lid swelling for past 19 years with sudden exacerbation since last 4 months. The image shows increased ^{68}Ga -DOTANOC uptake reflective of somatostatin receptor expression in relation to bilateral lacrimal glands

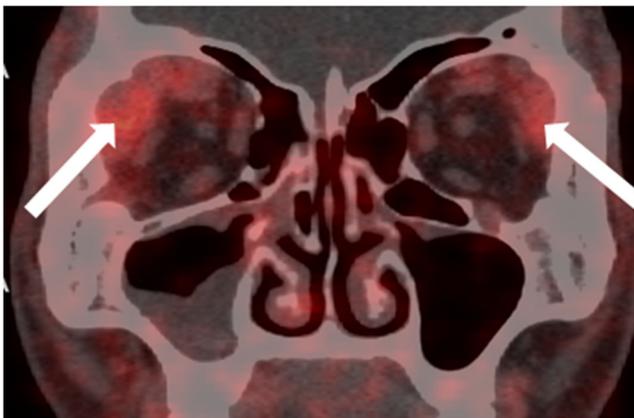


Fig. 2 Coronal section of ^{68}Ga -DOTANOC PET/CT scan. It reveals enlarged bilateral lacrimal glands with increased tracer uptake (white arrows; SUV_{max} right lacrimal gland, 1.89; SUV_{max} left lacrimal gland, 1.51; SUV_{max} background (right temporalis muscle), 0.54; and SUV_{max} pituitary fossa, 2.6)

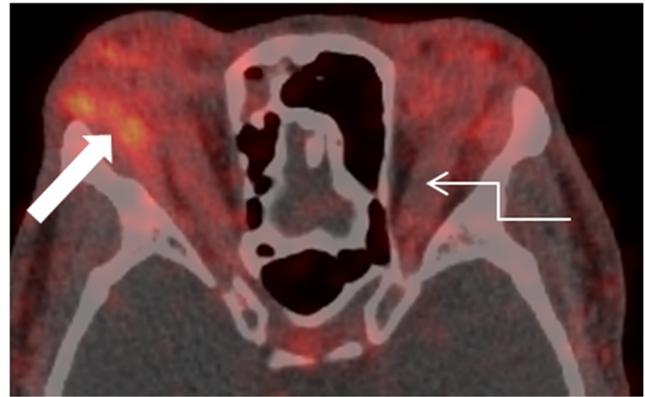


Fig. 3 Axial sections showing asymmetric increased uptake in bilateral enlarged lacrimal glands (right > left) (white arrow) and thickening of superior rectus muscle bellies (8.7 mm on the right side and 7.1 mm on the left side) (curved arrow)

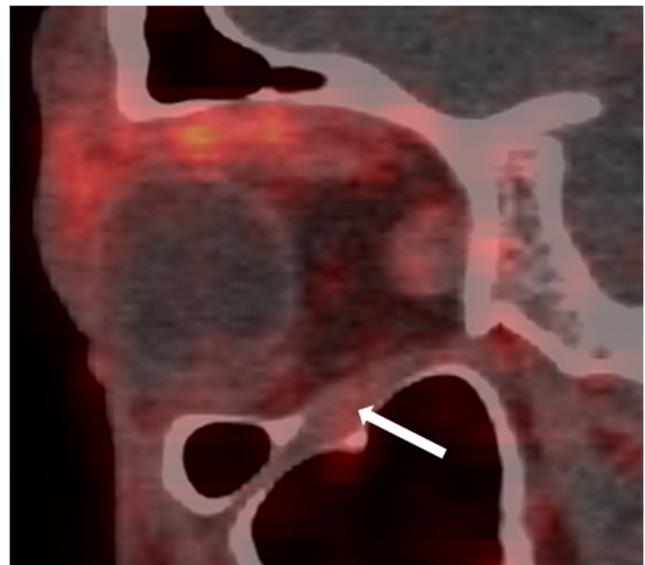


Fig. 4 Sagittal sections of CT focusing on orbits. It reveals thickened left infraorbital nerve on soft tissue window (thickness, 6.4 mm) (white arrow)

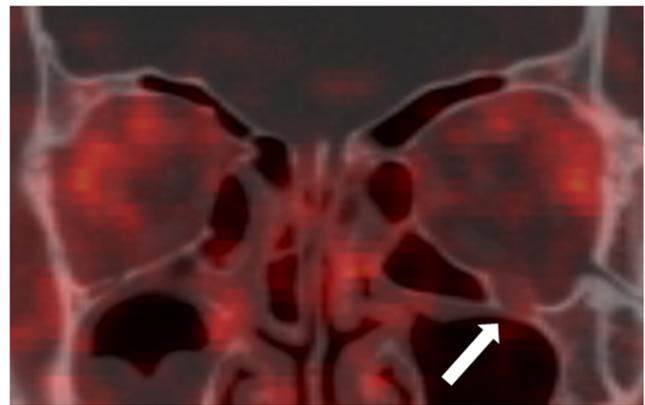


Fig. 5 Coronal section of CT scan. It reveals enlargement of the left infraorbital canal on bone window (white arrow). Infraorbital nerve involvement though is an uncommon finding, but it strongly suggests diagnosis of IgG4 disease, especially when associated with EOM and sinus involvement [8]

Fig. 6 Histopathological sections of biopsy taken from the right orbital soft tissue thickening. It shows infiltration of orbital soft tissue by lymphomononuclear cells, eosinophils, and histiocytes

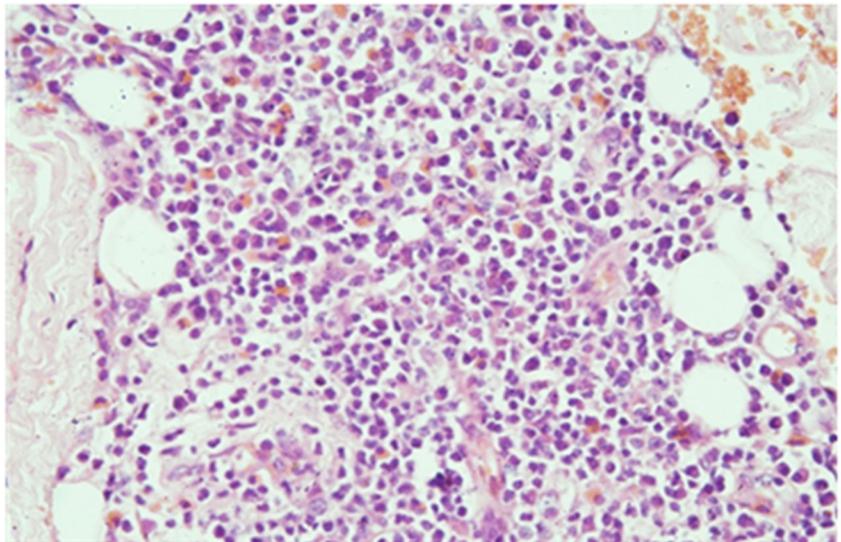
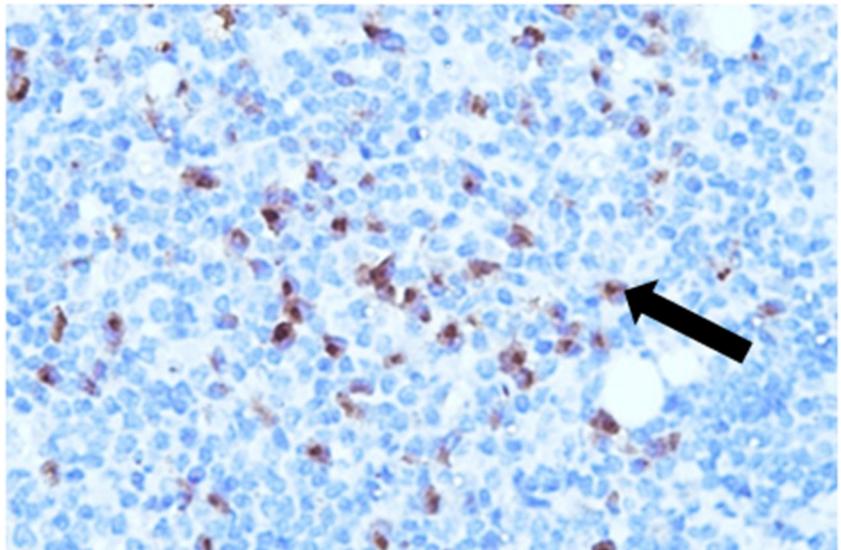


Fig. 7 Sections of IgG4 immunohistochemistry (IHC). It shows focal positivity for IgG4 stain (black arrow). Serum IgG4 level was 53 g/l (0.03–2.0 g/l). The diagnosis of this condition is based on a combination of clinical and imaging findings of tissue infiltration forming mass-like lesions, histopathological evidence of lymphoplasmacytic infiltration, storiform fibrosis, presence of inappropriate IgG4-positive cells, and elevated serum IgG4 levels [9]



Compliance with Ethical Standards

Conflict of Interest Saurabh Arora, Nishikant A. Damle, Rachna Meel, Sanjay Sharma, Seema Sen, Chandrasekar Bal, Kanaklata, Sneha Prakash, Divya Yadav, and Meivel Angamuthu declare no conflicts of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from the participant to be included in the study.

References

1. Cheuk W, Chan JK. IgG4-related sclerosing disease: a critical appraisal of an evolving clinicopathologic entity. *Adv Anat Pathol.* 2010;17:303–32.
2. Zen Y, Nakanuma Y. IgG4-related disease: a cross-sectional study of 114 cases. *Am J Surg Pathol.* 2010;34:1812–9.

3. Masaki Y, Dong L, Kurose N, Kitagawa K, Morikawa Y, Yamamoto M, et al. Proposal for a new clinical entity, IgG4-positive multiorgan lymphoproliferative syndrome: analysis of 64 cases of IgG4-related disorders. *Ann Rheum Dis*. 2009;68:1310–5.
4. McNab AA, McKelvie P. IgG4-related ophthalmic disease. Part II: clinical aspects. *Ophthal Plast Reconstr Surg*. 2015;31:167–78.
5. Katsura M, Mori H, Kunimatsu A, Sasaki H, Abe O, Machida T, et al. Radiological features of IgG4-related disease in the head, neck, and brain. *Neuroradiology*. 2012;54:873–82.
6. Cuccurullo V, Di Stasio GD, Prisco MR, Mansi L. Is there a clinical usefulness for radiolabeled somatostatin analogues beyond the consolidated role in NETs? *Indian J Radiol Imaging*. 2017;27:509–16.
7. Cheng Z, Song S, Han Y, Zou S, Zhy X. Elevated 68Ga-DOTATATE activity in IgG4-related lymphadenopathy. *Clin Nucl Med*. 2018;43:773–6.
8. Inoue D, Zen Y, Sato Y, Abo H, Demachi H, Uchiyama A, et al. IgG4-related perineural disease. *Int J Rheumatol [serial online]*. 2012;2012:401890.
9. Goto H, Takahira M, Azumi A. Diagnostic criteria for IgG4-related ophthalmic disease. *Jpn J Ophthalmol*. 2014;59:1–7.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.