

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case report

Multimodal imaging features of transient perivascular inflammation of the carotid artery (TIPIG) syndrome in a patient with Covid-19 [☆]

Evangelis Venetis, MD^{a,*}, Deborah Konopnicki, MD, PhD^b, Patrice Jissendi Tchofo, MD, PhD^a

^a Department of Radiology, CHU Saint-Pierre, Brussels, Belgium

^b Department of Infectious diseases, CHU Saint-Pierre, Brussels, Belgium

ARTICLE INFO

Article history:

Received 30 August 2021

Revised 2 December 2021

Accepted 3 December 2021

Keywords:

TIPIG syndrome

Carotidynia

Covid-19

Neck pain

Perivascular inflammation

ABSTRACT

We report the case of a 38-year-old man with transient perivascular inflammation of the carotid artery syndrome that occurred in the course of covid-19. We describe for the first-time multimodal imaging features of the perivascular changes surrounding the carotid artery, and long-term follow-up by ultrasound. The imaging features observed on ultrasound, angiography-CT, MRI and FDG-Pet scan support the hypothesis of the inflammatory nature of the perivascular tissue thickening. The ultrasound follow-up confirmed the spontaneous resolution of the lesion, leaving on site some residual changes as sequelae. The good knowledge of the imaging features reported herein helps to recognize this entity in patients with covid-19.

© 2021 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

Transient perivascular inflammation of the carotid artery (TIPIG) syndrome was first described by Fay in 1927 as carotidynia [1]. Since that time, considering carotidynia as a disease entity has been controversial. However, recent papers have re-defined it as TIPIG syndrome based on clinical and imaging features [2]. Up to date, the etiology is unclear, and the disease has been reported in association with various conditions, and even in the absence of any disease context [3]. We present the Ultrasound (US), CT angiography, MRI and ¹⁸FDG-Pet-scan features, as well as the follow-up by US, of tissular changes

surrounding the carotid artery in a patient with covid-19. According to all findings, these changes were thought to be inflammatory and transient, leading to the diagnosis of TIPIG syndrome.

Case report

A 38-year-old male, presented himself to his family Doctor with acute focal neck pain that had an increased intensity over 5 days, to the point of feeling like a knife tip pressure, which irradiated to the mandibular angle. The pain was not released after taking paracetamol and non-steroids anti-inflammatory drugs. He reported having experienced 2 weeks ago some mild

[☆] Competing Interests: The authors have declared that no competing interests exist.

* Corresponding author. E. Venetis.

E-mail address: evangelis_venetis@hotmail.com (E. Venetis).

<https://doi.org/10.1016/j.radcr.2021.12.005>

1930-0433/© 2021 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

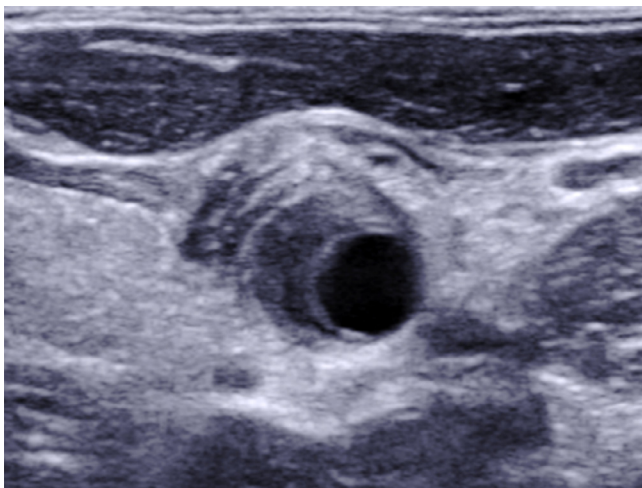


Fig. 1 – Ultrasound- cross-section at the mid-high of the left common carotid artery at presentation (A) showing eccentric thickening of the carotid wall without stenosis; follow-up at day 7 after the first exam (B) showed spontaneous regression of the wall thickening, which remained stable until the last control, 16 weeks later (C), consistent with a sequela.

symptoms of Covid-19 infection including: cough, myalgia, and fever. The PCR test performed the day after the symptoms started was positive for SARS-Cov 2 alpha variant. The clinical examination reported focal soft swelling of fingertip size located at the middle-left neck close to the carotid artery. Laboratory findings encompassed: elevated inflammatory markers such as CRP (11,9 mg/L), Erythrocyte sedimentation rate (32 mm/h), but no abnormal levels of auto-immune antibodies (FANC, ANCA and CCP AB).

Doppler Ultrasound examination of the neck showed eccentric hypoechoic thickening of the medial aspect of the left common carotid artery, extending over 35 mm along the vessel axis. The intima-media interface could be differentiated and there was no narrowing of the lumen (Fig. 1A). No abnormal cervical lymph node was found. CT angiography of the supra-aortic trunks showed a tissue that encased the carotid artery, without obstructing the lumen, with slight enhancement on the late images (Figs. 2A, B and C). To better characterize that tissue, head and neck MRI and ^{18}F FDG-Pet-Scan were done. MRI showed enhancement of the abnormal tissue surrounding the carotid, extending to the subintimal space (Figs. 3A, B and C), with no lumen stenosis (Fig. 3D). ^{18}F FDG-Pet-scan showed significant focal uptake surrounding the left common carotid artery (Figs. 4A and B). The enhancement on CT and subtracted T1-weighted images, as well as the ^{18}F FDG uptake, were in favor of the acute inflammatory nature of the lesion.

The follow-up by ultrasound showed decreased in size of the lesion just 7 days after the first exam, and without any treatment (Fig. 1B), and no more change 16 weeks later (Fig. 1C). The residual carotid wall thickening was thus considered as inflammatory sequelae (Figs. 1B and C).

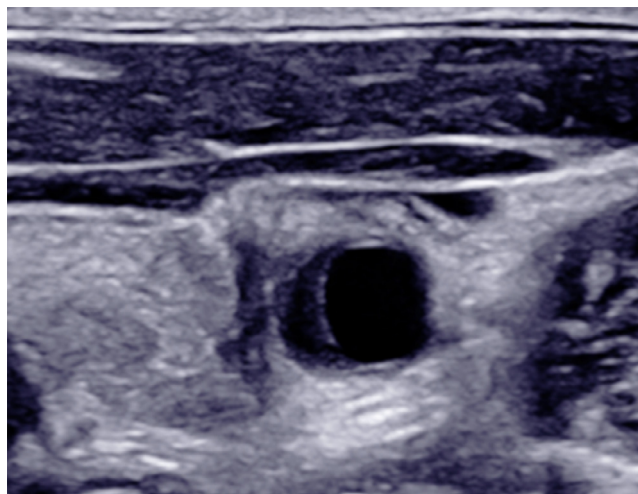


Fig. 1 – Continued

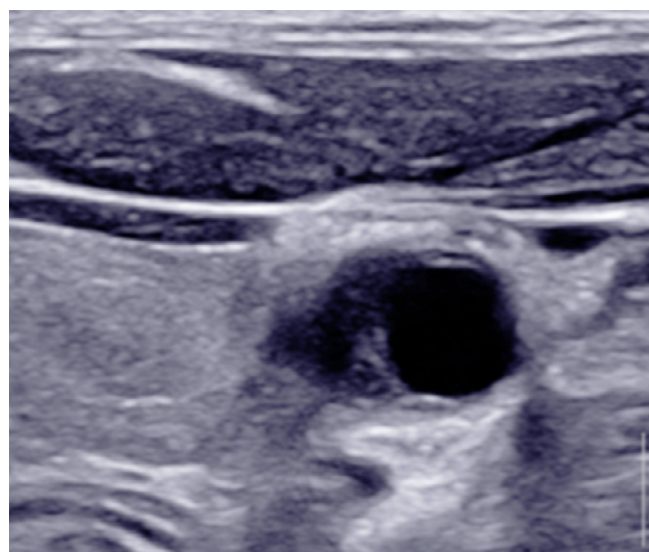


Fig. 1 – Continued

Discussion

TIPIC syndrome is a rare disease. The first case, so-called carotidynia, was reported in 1927 [1]. Since then, more than 90 cases can be found in the literature. The debate on whether it is a single entity or a sign that can be present in several disease conditions is still ongoing [3]. Recently it has been recognized among the complications of Covid-19 [4,5].

The typical clinical presentation consists of focal neck pain right at the point of the acute inflammatory process. The pain is most often unilateral, at the level of the carotid artery bifurcation. However, the location varies along the common carotid artery from the neck base to the carotid bulb. In our case, the inflammation was located in between. The morphology of the lesion on all imaging modalities is typically an eccentric perivascular thickening of the carotid wall. The inflam-

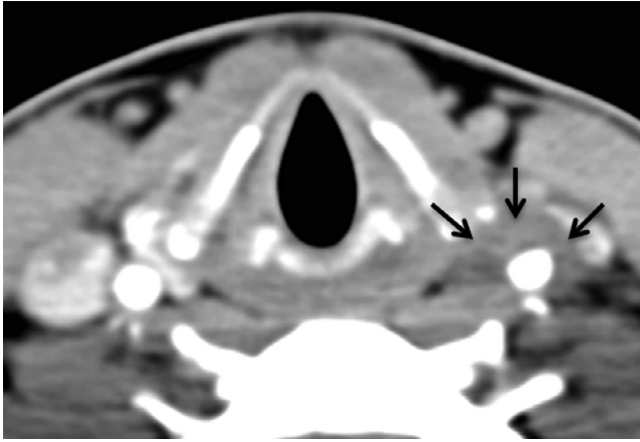


Fig. 2 – CT-angiography at the same level, on arterial (A, arrows) and venous (B, arrows) phases, shows the tissular and perivascular topography of the lesion that slightly enhances; the lumen is not compromised as compared to the right carotid (C, arrows).

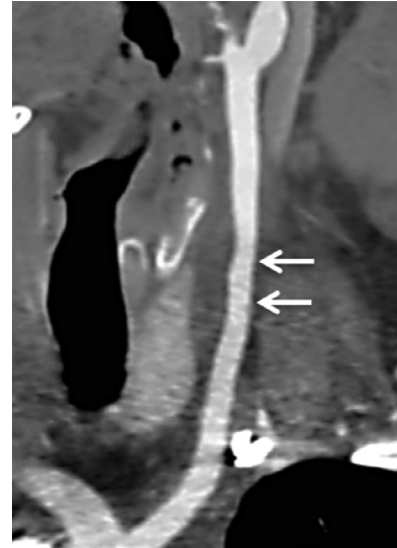


Fig. 2 – Continued

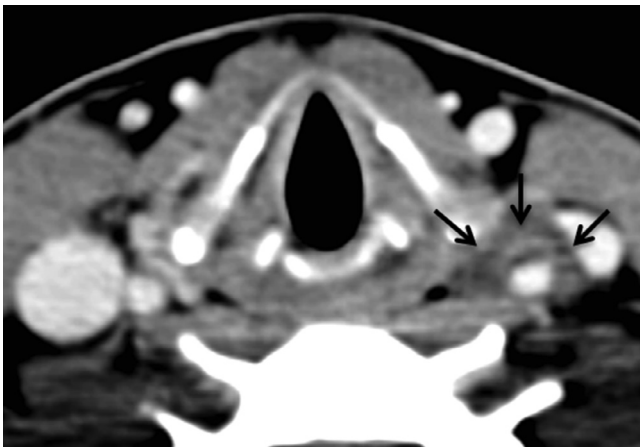


Fig. 2 – Continued

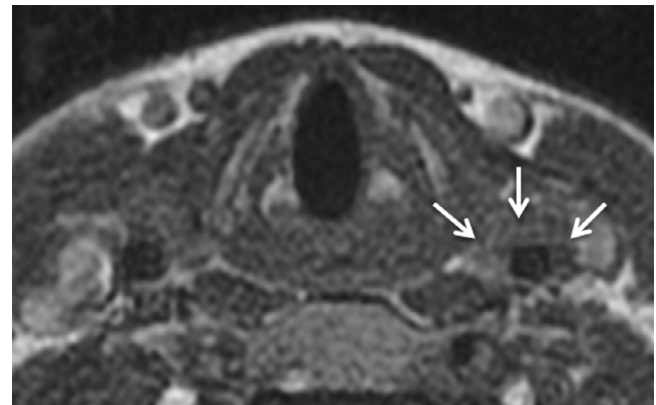


Fig. 3 – Axial MR T1-weighted images without (A, arrows) and with contrast (B, arrows) show the gadolinium enhancement of the perivascular tissue, better seen on subtracted image (C, long arrows); on this image, the intima layer could be seen as a dark line next to the lumen and separated from the enhancing tissue by a bright signal; the vascular coronal MIP confirms the preservation of the carotid lumen (C, short arrow); in addition, as on CTA, the lumen is not compromised (D, arrows).

matory nature of the tissular thickening around the carotid artery can be attested based on multiple findings, as in our case. Concomitant biology may show elevation of the inflammatory surrogates in the blood sample (CRP, erythrocyte sedimentation rate) [2]. Doppler ultrasound, showing low velocity flows within the tissue, and focal enhancement observed on CTA and MR images favored inflammation. In addition to the previous findings, the ^{18}F FDG uptake confirmed focal perivascular inflammation [6]. Recent papers have described these inflammatory changes [2,3] and confirmed them by a pathology study [7]. However, this is the first report to present all multimodal imaging findings in the same patient. Thanks to US and MRI, we noticed that inflammation was perivascular and transparietal since it involved the outer layers of the vessel wall (adventitia and media), preserving the intima.

The etiology of TIPIC syndrome is unclear. It has been described in various conditions, including autoimmune diseases (Sjögren syndrome, Hashimoto thyroiditis, Systemic lu-

pus erythematosus), recent trauma or recent viral episode, and flu-like symptoms and even in subjects with no vascular risk factors [2]. Thrombotic events that occur in the acute phase of Covid-19 have been widely reported [6,7]. The thrombosis often obliterates the vessel lumen, by invading endothelial cells, instead of inducing perivascular inflammation with preservation of the intima layer [8,9]. It is not clear how the SARS-Cov-2 virus may induce the process that leads to TIPIC syndrome, but, according to our report and the previous, TIPIC syndrome can be considered among the spectrum of intra- and perivascular inflammatory-thrombotic events due to Covid-19 [3,5].

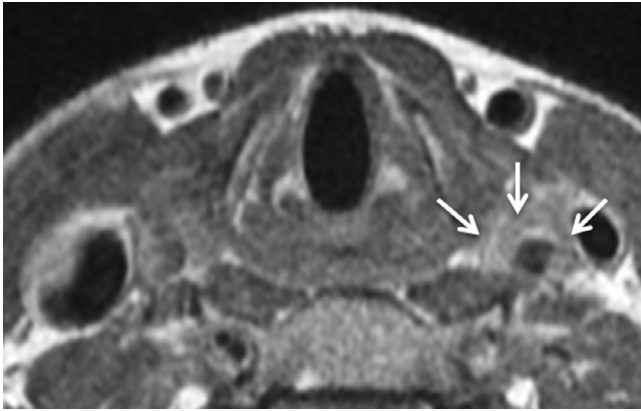


Fig. 3 - Continued

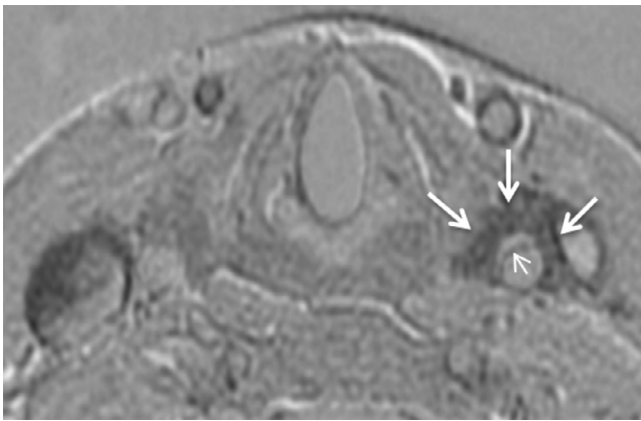


Fig. 3 - Continued



Fig. 3 - Continued

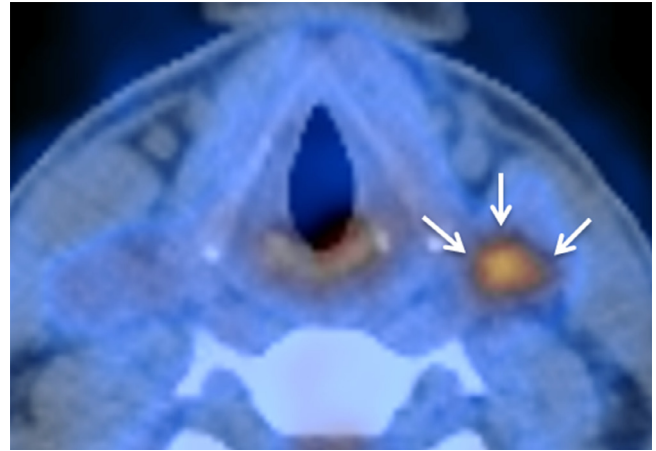


Fig. 4 - ¹⁸F-DG-Pet-scan uptake maps fused with CT images, both on axial (A, arrows) and coronal (B, arrows) planes, show a strong uptake at the level of perivascular changes consistent with an inflammatory process.

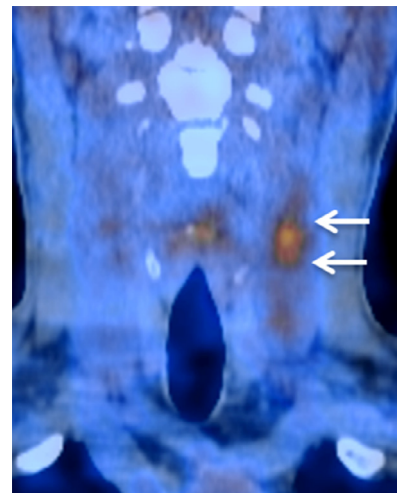


Fig. 4 - Continued

The course of TIPIC syndrome is also atypical and often ends with spontaneous regression of the symptoms within 2 weeks [2,10]. Close follow-up by ultrasound in our case showed a decrease of the carotid wall thickening from day 3. According to the reconstructed timeline of the disease course: inflammation might have appeared 1 week after the Covid-19 symptoms started, with increasing intensity during the next 5 days, until the time the first neck US was done, and after that, a decrease in symptoms as well as on images, with a complete resolution of symptoms by the end of the fourth week after Covid-19 started. The abnormal images may completely resolve or turn into a scar as observed by ultrasound. In our patient, regardless of the Covid-19 course, TIPIC syndrome had the same evolution as other reported cases. We can therefore speculate that TIPIC might be a collateral effect of systemic inflammation, whatever the trigger is.

Conclusion

Our report is the first to present multimodal imaging of TIPIC syndrome in the context of acute Covid-19 disease in a young patient, along with the long-term follow-up of the lesion. We found the perivascular inflammation to involve the vessels walls with preservation of the intima layer. The inflammatory nature of the perivascular changes is supported by multimodal imaging findings including ¹⁸F-DG-Pet-scan. We also observed the early spontaneous regression of the inflammatory changes and its end-stage by means of US imaging. Our report adds to the imaging features that can help to recognize this entity, which might be underdiagnosed in patients with Covid-19.

Patient consent

Oral and signed consent was obtained from the patient.

Availability of data and materials

All data come from the CHU Saint-Pierre at Brussels.

REFERENCES

- [1] Fay T. Atypical neuralgia. *Arch Neurol Psychiat* 1927;18:309–15.
- [2] Lecler A, Obadia M, Savatovsky J, Picard H, Charbonneau F, Menjot de Champfleur N, et al. TIPIC syndrome: beyond the myth of carotidynia, a new distinct unclassified entity. *Am J Neuroradiol* 2017;38(7):1391–8.
- [3] Hersh SP, Gerard P, Hersh J. Carotidynia versus Transient Perivascular Inflammation of the Carotid Artery (TIPIC) syndrome: finding common ground. *Cureus* 2021;13(9):e17684.
- [4] Mumoli N, Evangelista I, Colombo A, Conte G, Mazzone A, Barco S. Transient perivascular inflammation of the carotid artery (TIPIC) syndrome in a patient with COVID-19. *Int J Infect Dis* 2021;108:126–8.
- [5] Mahammedi A, Ramos A, Bargalló N, Gaskill M, Kapur S, Saba L, et al. Brain and lung imaging correlation in patients with COVID-19: could the severity of lung disease reflect the prevalence of acute abnormalities on neuroimaging? A global multicenter observational study. *Am J Neuroradiol* 2021;42(6):1008–16.
- [6] Amaravadi RR, Behr SC, Kousoubris PD, Raja S. [¹⁸F] Fluorodeoxyglucose positron-emission tomography-CT imaging of carotidynia. *Am J Neuroradiol* 2008;29(6):1197–9.
- [7] Upton P. Histologic confirmation of carotidynia. *Otolaryngol Head Neck Surg* 2003;129(4):443–4.
- [8] Esenwa C, Cheng NT, Lipsitz E, Hsu K, Zampolin R, Gersten A, et al. COVID-19-associated carotid atherothrombosis and stroke. *Am J Neuroradiol* 2020;41(11):1993–5.
- [9] Iba T, Connors JM, Levy JH. The coagulopathy, endotheliopathy, and vasculitis of COVID-19. *Inflamm Res* 2020;69(12):1181–9.
- [10] Ulus S, Aksoy Ozcan U, Arslan A, Buturak A, Dincer A, Kara S, et al. Imaging spectrum of TIPIC syndrome: validation of a new entity with vessel wall imaging. *Clin Neuroradiol* 2020;30(1):145–57.