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CASE SERIES

TRANSIENT PERIVASCULAR INFLAMMATION OF THE CAROTID ARTERY: CLINICAL AND IMAGING FEATURES IN A CASE SERIES DURING THE COVID-19 PANDEMIC

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Abstract

Background. Transient perivascular inflammation of the carotid artery (TIPIC) syndrome is an uncommon, self-limiting, inflammatory condition, characterized by unilateral neck pain and perivascular carotid inflammation. Current evidence remains limited to case reports and small case series.
The objective of the study was to evaluate the clinical presentation, imaging characteristics, management, and outcomes in a cohort of patients with TIPIC syndrome diagnosed during the COVID-19 pandemic.
Material and methods. In this retrospective single-center study, 13 consecutive patients (mean age 42.9±11.8 years; 8 women, 5 men) with clinical and imaging findings consistent with TIPIC syndrome were included. Ultrasound was performed in all patients, while magnetic resonance imaging was used in selected cases. Clinical follow-up was available for all patients. All cases were diagnosed during the COVID-19 pandemic period, between March 2021 and August 2023.
Results. All patients presented with acute cervical pain localized to the carotid region. Involvement was right-sided in 9 patients (69.2%), left-sided in 3 patients (23.1%), and bilateral in one patient (7.7%). Imaging demonstrated eccentric perivascular soft tissue thickening without significant luminal narrowing. The average lesion length was 17.2 mm, and average maximal

Résumé

Inflammation périvasculaire transitoire de l'artère carotide: caractéristiques cliniques et radiologiques dans une série de cas durant la pandémie de COVID-19

Introduction. Le syndrome TIPIC (inflammation périvasculaire transitoire de l'artère carotide) est une affection inflammatoire rare et spontanément résolutive, caractérisée par une douleur cervicale unilatérale associée à une inflammation périvasculaire de l'artère carotide. Les données actuellement disponibles dans la littérature reposent principalement sur des rapports de cas isolés et de petites séries.
L'objectif de l'étude a été d'évaluer les manifestations cliniques, les caractéristiques radiologiques, la prise en charge et l'évolution des patients présentant un syndrome TIPIC diagnostiqué durant la pandémie de COVID-19.
Matériel et méthodes. Cette étude rétrospective monocentrique a inclus 13 patients consécutifs (âge moyen 42,9±11,8 ans; 8 femmes et 5 hommes) présentant des signes cliniques et radiologiques compatibles avec un syndrome TIPIC. Une échographie a été réalisée chez tous les patients, tandis qu'une imagerie par résonance magnétique a été effectuée dans des cas sélectionnés. Un suivi clinique était disponible pour tous

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thickness was 5.6 mm. Complete clinical resolution occurred in 12/13 patients (92.3%) within an average of 14.5 days. One patient (7.7%) had persistent symptoms.
Conclusions. TIPIC syndrome is a benign, self-limiting condition with characteristic imaging features. The temporal occurrence of all cases during the COVID-19 pandemic suggests a possible association with infectious or immune-mediated mechanisms. Recognition of this entity is essential to avoid misdiagnosis and unnecessary interventions.

Keywords: TIPIC syndrome, carotidynia, perivascular inflammation, neck pain.

List of abbreviations:
COVID-19 – coronavirus disease 2019
CRP – C-reactive protein
CT – computed tomography
ESR – rrythrocyte sedimentation rate
IgG – immunoglobulin G
IgM – immunoglobulin M
MRI – magnetic resonance imaging
NHL – non-Hodgkin lymphoma
NSAIDs – nonsteroidal anti-inflammatory drugs
T1 – T1-weighted magnetic resonance imaging sequence
T2 – T2-weighted magnetic resonance imaging sequence
TIRM – turbo inversion recovery magnitude
TIPIC – transient perivascular inflammation of the carotid artery
US – ultrasound

les patients. Tous les cas ont été diagnostiqués entre mars 2021 et août 2023.
Résultats. Tous les patients présentaient une douleur cervicale aiguë localisée au niveau carotidien. L'atteinte était droite dans 9 cas (69,2%), gauche dans 3 cas (23,1%) et bilatérale dans un cas (7,7%). L'imagerie montrait un épaississement excentré des tissus mous périvasculaires sans sténose significative de la lumière artérielle. La longueur moyenne des lésions était de 17,2±1,6 mm et l'épaisseur maximale moyenne de 5,6±1,8 mm. Une résolution clinique complète a été observée chez 12 patients (92,3%) dans un délai moyen de 14,5±6,5 jours. Un patient présentait des symptômes persistants.
Conclusions. Le syndrome TIPIC est une affection bénigne et spontanément résolutive présentant des caractéristiques radiologiques spécifiques. La survenue temporelle de tous les cas durant la pandémie de COVID-19 suggère une possible implication de mécanismes inflammatoires ou immunitaires. La reconnaissance de cette entité est essentielle afin d'éviter des erreurs diagnostiques et des investigations inutiles.

Mots-clés: syndrome TIPIC, carotidynie, inflammation périvasculaire, douleur cervicale.

Introduction

Transient perivascular inflammation of the carotid artery (TIPIC) syndrome is a clinical-radiological entity characterized by transient inflammation surrounding the carotid artery, most commonly at the carotid bifurcation. It represents a modern redefinition of the historical entity carotidynia, supported by reproducible imaging findings[1,2]. Clinically, patients typically present with acute unilateral neck pain and focal tenderness over the carotid artery. Imaging plays a central role in diagnosis, demonstrating eccentric perivascular soft tissue thickening with contrast enhancement, while the arterial lumen is generally preserved[3,4].

Despite increasing recognition, the available literature remains limited, with most reports consisting of single cases or small series[5]. The natural history is considered favorable, with spontaneous resolution or response to anti-inflammatory therapy. The COVID-19 pandemic has been associated with a broad spectrum of vascular and inflammatory manifestations, including endothelial dysfunction and immune-mediated injury[6–9]. Whether such mechanisms contribute to localized perivascular inflammation, as observed in TIPIC syndrome, remains unclear.

The objective of the study was to describe the clinical presentation, imaging findings, and outcomes in a series of 13 patients with TIPIC syndrome diagnosed during the COVID-19 pandemic period, between March 2021 and August 2023.

Materials and methods

Study Design

This is retrospective single-center case series study, performed in The American Hospital of Tirana, Albania. Thirteen consecutive patients diagnosed with TIPIC syndrome between March 2021 and August 2023 were included. All patients were diagnosed during the COVID-19 pandemic period. Clinical records were reviewed for evidence of recent or concurrent SARS-CoV-2 infection, when available;

Table 1. Clinical and imaging characteristics of patients with TIPIC syndrome

No.	*Age/Sex*	*Side*	*Length (mm)*	*Thickness (mm)*	*Symptom resolution*	*Imaging follow-up*	*COVID-19 status*	*Relevant history*	*Treatment*
1	55/F	Left	18	5.0	4 days	No US/MRI	Positive history, elevated CRP and ESR	Mandibular tumour diagnosed later	NSAIDs
2	35/F	Right	17	8.3	6 days	US follow-up	Positive IgG	Previous NHL	NSAIDs
3	63/F	Right	16	4.0	16 days	US + MRI	No COVID-19	None	NSAIDs + corticosteroids
4	21/M	Right	14	2.7	4 days	No follow-up	Negative IgM/IgG	None	NSAIDs
5	45/M	Right	18	4.3	14 days	US follow-up	Previous COVID-19	None	NSAIDs
6	36/M	Bilateral	15	4.6	1 month	Persistent US findings, CT performed	Previous COVID-19	None	NSAIDs
7	42/M	Left	14	5.6	18 days	No follow-up	Previous COVID-19	None	NSAIDs
8	40/F	Right	17	2.3	7 days	US follow-up	Previous COVID-19	None	NSAIDs
9	36/F	Right	15	2.0	10 days	No follow-up	Previous COVID-19	None	NSAIDs
10	37/F	Right	17	2.3	12 days	No follow-up	Previous COVID-19	None	NSAIDs
11	50/M	Right	17	2.8	14 days	US follow-up	Previous COVID-19	None	NSAIDs
12	55/F	Right	19.2	4.5	10 days	No follow-up	Previous COVID-19	None	NSAIDs
13	43/F	Left	18	4.3	18 days	MRI performed	Previous COVID-19	None	NSAIDs

Abbreviations: US = ultrasound; MRI = magnetic resonance imaging; CT = computed tomography; NHL = non-Hodgkin lymphoma; NSAIDs = nonsteroidal anti-inflammatory drugs; CRP = C-reactive protein; ESR = erythrocyte sedimentation rate.

however, a systematic virological assessment was not performed in all patients (Table.1).

Demographics

The mean age of the patients was 42.9±11.8 (range 21–63 years). Sex distribution: 8 women (61.5%) and 5 men (38.5%).

Inclusion Criteria:

- Acute cervical pain localized to the carotid region.
- Imaging findings consistent with TIPIC syndrome.
- Absence of significant atherosclerosis, arterial dissection, or vasculitis.

Imaging Protocol

Ultrasound was performed in all patients as the initial imaging modality. Magnetic resonance imaging (MRI) (T1, T2, and contrast-enhanced sequences) was performed in selected cases.

The evaluation included: perivascular soft tissue thickening, maximal thickness and longitudinal extent, carotid lumen integrity.

Follow-Up

The clinical follow-up was available for all patients. Resolution was defined as complete symptom disappearance. Ultrasound follow-up was also performed in the same patients (Table 1).

Results

All 13 patients presented with acute unilateral neck pain localized to the carotid region. No neurological deficits were observed. Information regarding SARS-CoV-2 infection status was not available in most of the patients. The distribution of patients according to pain location: right cervical pain in 9 patients (69.2%), left cervical pain in 3 patients (23.1%), and bilateral pain in one patient (7.7%).

All patients demonstrated eccentric perivascular soft tissue thickening and preserved arterial lumen at imaging. The mean lesion length was 17.2±1.6 mm, and the mean maximal thickness 5.6±1.8 mm (Figure 1.)

MRI confirmed perivascular contrast enhancement and inflammatory characteristics (Figure 2).

Regarding the outcomes, complete resolution occurred in 12 patients (92.3%), and the mean time was 14.5±6.5 days (Figure 3). One patient (7.7%) had persistent ultrasound findings (Figure 4). No vascular complications were observed.

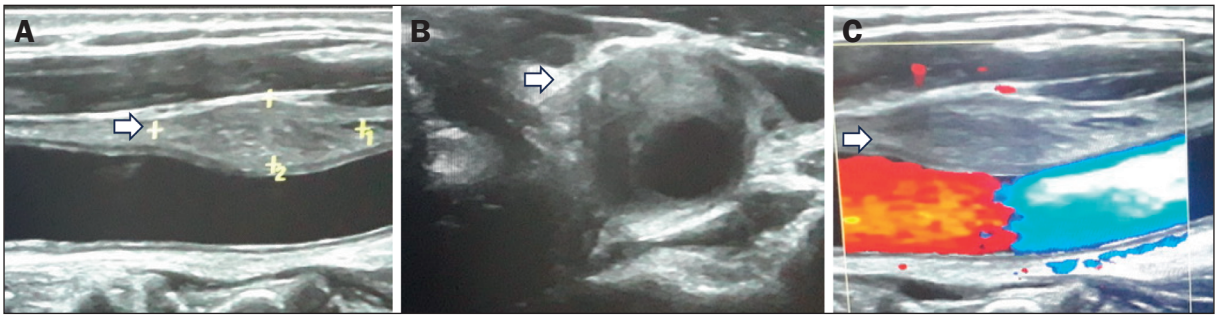


Figure 1. Ultrasound findings in TIPIC syndrome
Legend: Longitudinal (A) and transverse (B) grayscale ultrasound images of the common carotid artery demonstrate eccentric hypoechoic perivascular soft tissue thickening (arrows) at the carotid bifurcation. The arterial lumen is preserved without significant stenosis. Color Doppler imaging (C) shows normal intraluminal flow without hemodynamic disturbance, supporting a non-stenotic inflammatory process.

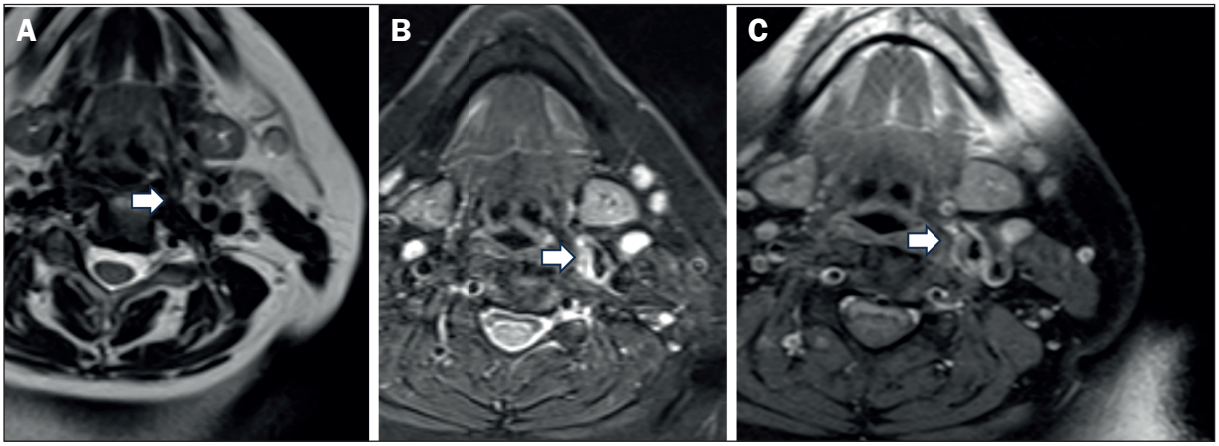


Figure 2. MRI findings of TIPIC syndrome
Legend: Axial T2-weighted image (A) and axial T2 TIRM (B) demonstrates hyperintense perivascular soft tissue thickening surrounding the carotid artery (arrow). Post-contrast T1-weighted image (C) shows avid eccentric perivascular enhancement, consistent with active inflammation. The arterial lumen remains patent without evidence of dissection or significant narrowing.

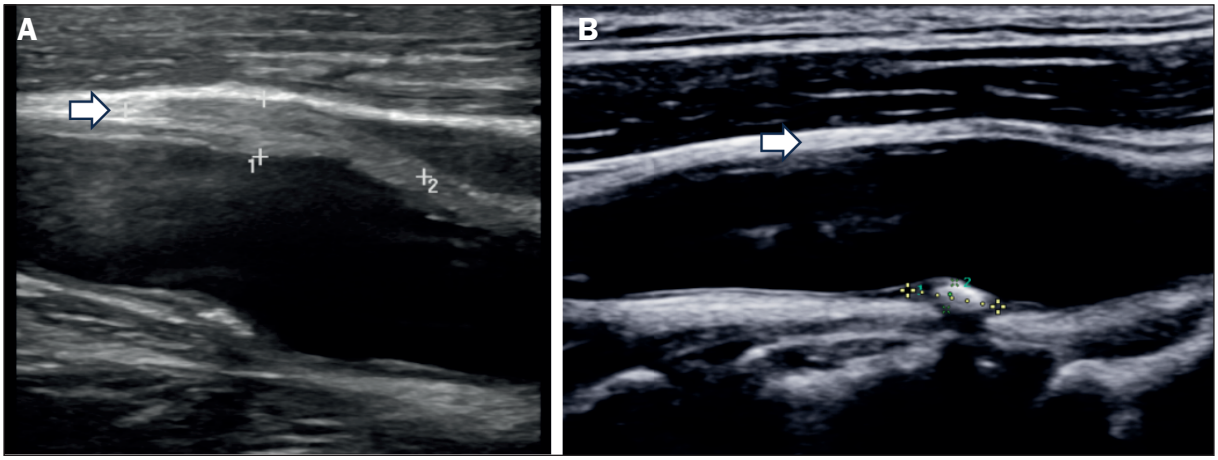


Figure 3. Follow-up imaging showing resolution
Legend: Follow-up ultrasound (A) demonstrates the previously observed perivascular thickening. Corresponding (B), confirms resolution of perivascular thickening, consistent with the transient and self-limiting nature of TIPIC syndrome.

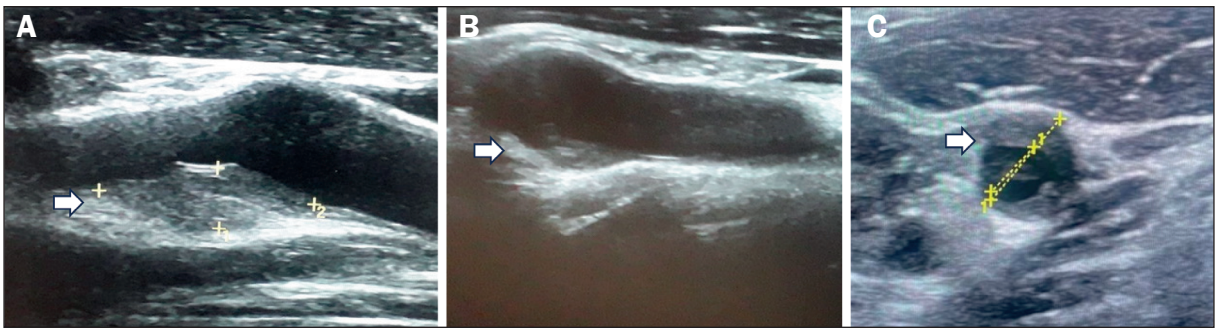


Figure 4. Bilateral TIPIC involvement (atypical case)
Legend: Longitudinal ultrasound images A (right side) dhe B (left side) demonstrates bilateral perivascular soft tissue thickening (arrows) involving both carotid arteries, representing an atypical presentation.Despite bilateral involvement, luminal patency is preserved. Persistent perivascular thickening three years later on axial ultrasound image C.

Discussion

TIPIC syndrome remains an uncommon and likely underrecognized inflammatory condition involving the carotid artery. Since the reclassification of carotidynia under the term TIPIC syndrome by Lecler et al.[1], growing attention has focused on its characteristic imaging features and favorable clinical course. In the present study, we report a relatively large single-center series of 13 patients diagnosed over a defined period, thereby contributing additional clinical and radiological data to the still limited body of literature on this entity[1,3,5].

The demographic characteristics of our cohort were generally consistent with previous studies describing TIPIC syndrome predominantly in middle-aged adults without a clear sex predilection. In our series, women represented 61.5% of cases, with a mean age of 42.9±11.8 years. Comparable age distributions have been reported by Vallée et al. and Kosaka et al., supporting the observation that TIPIC syndrome most frequently affects individuals in the fourth and fifth decades of life[3,5].

Clinically, all patients presented with acute localized cervical pain, which remains the cardinal manifestation of the disease. None of the patients demonstrated neurological deficits, and the clinical course was generally self-limited, further supporting the concept of TIPIC syndrome as a benign inflammatory condition rather than a primary occlusive vascular disorder. Right-sided involvement predominated in our cohort (69.2%), a finding that has also been described in prior reports, although the underlying reason for this asymmetrical distribution remains uncertain.

Imaging findings in our study were highly characteristic and reproducible. Ultrasound consistently demonstrated eccentric hypoechoic perivascular soft tissue thickening surrounding the carotid bifurcation, while preserving luminal patency and normal Doppler flow. MRI, when performed, confirmed perivascular inflammatory tissue characterized by T2 hyperintensity and contrast enhancement. These findings closely correspond to the imaging criteria proposed by Lecler et al. and subsequently summarized by Kosaka et al., who emphasized eccentric perivascular infiltration without significant luminal narrowing as the principal imaging hallmark of TIPIC syndrome[1,3]. Preservation of the vascular lumen is particularly important in distinguishing TIPIC syndrome from carotid artery dissection, large-vessel vasculitis, and atherosclerotic plaque disease.

Differential diagnosis remains essential because the clinical presentation may overlap with several vascular and inflammatory conditions. Carotid artery dissection typically demonstrates mural hematoma, intimal flap, or luminal stenosis, findings absent in our cohort. Giant cell arteritis and Takayasu arteritis generally present with circumferential arterial wall thickening accompanied by systemic inflammatory manifestations, whereas TIPIC syndrome characteristically demonstrates focal eccentric perivascular inflammation with rapid clinical improvement. Infectious lymphadenitis, peritonsillar inflammatory disease, and head and neck neoplasms may also mimic TIPIC syndrome clinically, highlighting the central role of imaging in excluding alternative diagnoses.

The pathophysiology of TIPIC syndrome remains incompletely understood. Histopathological evidence is limited because biopsy is rarely indicated given the benign and self-limiting nature of the condition. Current hypotheses suggest a transient inflammatory process involving the carotid adventitia and surrounding connective tissues. Proposed mechanisms include autoimmune, viral, and post-infectious inflammatory reactions. Notably, all cases in our study occurred between March 2021 and August

2023, corresponding to the COVID-19 pandemic period. Although systematic virological confirmation was not available in all patients, this temporal clustering is noteworthy.

COVID-19 infection has been strongly associated with endothelial dysfunction, vascular inflammation, thromboinflammatory phenomena, and immune dysregulation[6-9]. Varga et al. demonstrated direct endothelial involvement in SARS-CoV-2 infection, while Ackermann et al. described diffuse vascular inflammation and endothelial injury in affected patients[6,7]. These mechanisms may theoretically contribute to localized perivascular inflammatory processes such as TIPIC syndrome. Furthermore, post-infectious immune-mediated reactions have increasingly been recognized following both SARS-CoV-2 infection and vaccination[9]. Although our study cannot establish a causal relationship, the observed temporal association raises the possibility that systemic inflammatory activation may contribute to the development of TIPIC syndrome in susceptible individuals.

The prognosis in our cohort was favorable, with complete clinical resolution observed in 92.3% of patients within approximately two weeks. This outcome is consistent with previous reports describing spontaneous improvement or rapid response to nonsteroidal anti-inflammatory therapy[1,3,5]. Nevertheless, one patient in our series demonstrated persistent imaging abnormalities during long-term follow-up, suggesting that a subset of patients may experience prolonged or recurrent inflammatory changes. Similar persistent or recurrent presentations have occasionally been described in the literature, indicating that TIPIC syndrome may not invariably follow a uniformly transient course[3,5].

The present study has several limitations. First, its retrospective single-center design and relatively small sample size limit the generalizability of the findings. Second, MRI examinations were not available for all patients, potentially limiting comprehensive radiological characterization. Third, systematic laboratory and virological investigations, including SARS-CoV-2 testing, were not uniformly performed, precluding definitive assessment of possible infectious or immune-mediated associations. Despite these limitations, our study contributes additional evidence supporting the characteristic imaging appearance, benign clinical course, and possible inflammatory pathophysiology of TIPIC syndrome.

In conclusion, TIPIC syndrome should be considered in patients presenting with acute unilateral cervical pain and characteristic eccentric perivascular inflammation at the carotid bifurcation. Recognition of its distinctive imaging findings is essential to avoid unnecessary invasive investigations and to differentiate this benign entity from more serious vascular disorders. Further multicenter studies with larger cohorts and standardized follow-up are warranted to clarify its underlying pathophysiological mechanisms and potential association with systemic inflammatory conditions, including COVID-19-related immune responses.

Limitations of the study

Our study has several limitations. First, the retrospective design and relatively small sample size limit statistical power and generalizability. Second, MRI was not performed systematically in all patients, potentially limiting comprehensive imaging comparison. Third, virological and immunological investigations related to SARS-CoV-2 infection were incomplete, preventing definitive evaluation of a causal relationship between COVID-19 and TIPIC syndrome. Finally, histopathological confirmation was unavailable, although this limitation is common in previously published series due to the benign nature of the disease.

Despite these limitations, our study contributes additional evidence supporting TIPIC syndrome as a distinct clinical-radiological entity with characteristic imaging findings and favorable prognosis. Increased awareness among radiologists and clinicians is essential to avoid unnecessary invasive investigations, inappropriate antimicrobial therapy, or misdiagnosis of more severe vascular conditions.

Conclusions

TIPIC syndrome is a benign and self-limiting condition with characteristic imaging findings. Most patients experience rapid recovery; however, persistent cases may occur. The temporal clustering during the COVID-19 pandemic suggests a possible association with inflammatory mechanisms, warranting further investigation.

Author Contributions:

Conceptualization, B.T. and B.Z.; methodology, B.T.; software, E.V; validation, B.T. and A.M.; formal analysis, B.T.; investigation, B.T.; resources, B.T; data curation, A.A. and B.Z.; writing–original draft preparation, B.T.; writing–review and editing, B.Z,A.M,A.A.; visualization, A.V. and B,Z.; supervision, B.T.; project administration, B.T. All the authors have read and agreed with the final version of the article.

Compliance with Ethics Requirements:

"The authors declare no conflict of interest regarding this article"

"The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law. Informed consent was obtained from all the patients included in the study"

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