

## Thrombosis of The Superior Ophthalmic Vein: A Case Report

Fernanda Romagnole Pugliese<sup>1\*</sup>, Jamile Diogo de Araujo<sup>2</sup>, Ian Caldeira Ruppen<sup>3</sup>, Leandro Hideki Otani<sup>4</sup>, Lucas Magno Goedert<sup>5</sup>, Vitor Augusto Olivari do Carmo<sup>6</sup>, Geovani Almeida Gois<sup>7</sup>, Guilherme Enzo Giovanelli Mansano<sup>8</sup>, Lorena Lima Gargaro<sup>9</sup>, Nicole de Oliveira Santos<sup>10</sup>, Mariana Abucater Couto<sup>11</sup>, Lara Beatriz Dallaqua Bitiati<sup>12</sup>, Felicia Satie Ibuki Otani<sup>13</sup>, Gabriel Petermann<sup>14</sup>, Maiana Boian Vialle<sup>15</sup>

### Main Autor

<sup>1</sup>Unicesumar, Email: fer.pugliese@hotmail.com; ORCID: <https://orcid.org/0009-0005-1578-3559>

### Co-authors

<sup>2</sup>Hospital Universitário Regional de Maringá. ORCID: <https://orcid.org/0000-0002-6302-0864>

<sup>3</sup>Centro Universitário Ingá-UNINGÁ. ORCID: <https://orcid.org/0000-0003-1706-1662>

<sup>4</sup>Instituto Maringá de Imagem. ORCID: <https://orcid.org/0009-0000-6832-4907>

<sup>5</sup>Hospital de Olhos Noroeste do Paraná (Honorp). ORCID: <https://orcid.org/0009-0005-7406-8176>

<sup>6</sup>Centro Universitário Ingá-UNINGÁ

<sup>7</sup>Universidade Federal do Maranhão. ORCID: <https://orcid.org/0009-0008-1252-0827>

<sup>8</sup>Centro Universitário Ingá-UNINGÁ. ORCID: <https://orcid.org/0009-0006-5342-1468>

<sup>9</sup>Universidade Estadual de Maringá UEM. ORCID: <https://orcid.org/0000-0001-5676-4008>

<sup>10</sup>Universidade Estadual Paulista (UNESP). ORCID: <https://orcid.org/0000-0002-1977-7245>

<sup>11</sup>Centro Universitário Metropolitano da Amazônia (UNIFAMAZ). ORCID: <https://orcid.org/0000-0002-6006-2444>

<sup>12</sup>Centro Universitário Ingá-UNINGÁ. ORCID: <https://orcid.org/0009-0005-0722-9590>

<sup>13</sup>Instituto Maringá de Imagem

<sup>14</sup>Universidade Anhanguera Uniderp. ORCID: <https://orcid.org/0009-0007-5163-9380>

<sup>15</sup>Unicesumar. ORCID: <https://orcid.org/0000-0001-7854-6386>

\***Corresponding author:** Fernanda Romagnole Pugliese, Unicesumar, Email: fer.pugliese@hotmail.com; ORCID: <https://orcid.org/0009-0005-1578-3559>.

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### Abstract

*Orbital cellulitis represents a profound infection of the orbital cavity, which includes the eye, its adjacent muscles, nerves, blood vessels, and connective tissue. Among its serious complications, cavernous sinus thrombosis is a particularly rare but grave condition. This complication can precipitate a range of severe issues such as intense headaches, visual disturbances, and cranial nerve palsies, including ophthalmoplegia, ptosis, and sensory deficits in the facial region. Additionally, it may result in altered mental status. We present a case of a 15-year-old male who exhibited both neurological and ophthalmic symptoms, leading to the diagnosis of orbital cellulitis with subsequent extension into the cavernous sinus. This case underscores the severe progression and the critical importance of managing the complications associated with orbital cellulitis.*

**Keywords:** Cavernous Sinus Thrombosis, Orbital Cellulitis, Phlebography, Stroke, Sinusitis.

### Introduction

Orbital cellulitis is an inflammation and infection of the orbital cavity, the anatomical region where the eyeball and its attachments are located, including muscles, nerves, blood vessels, and subcutaneous tissue around the eyes. Most cases of this nature are secondary to sinus infections but may also result from a local bacterial infection. The disease can affect all age groups but is more common in children. Understanding these observations and definitions is crucial for comprehending the scientific proposal, as they are prerequisites for understanding the topic, making the

etiological approach a step that precedes other perspectives. It is important to note that the inflammation in question is primarily due to bacterial infections, skin trauma, or insect bites around the eyes.

Adjacent infections, such as sinusitis, conjunctivitis, dacryocystitis, and upper respiratory tract infections, can exacerbate the clinical picture and lead to pathological worsening. Orbital surgeries may cause infections, particularly in immunocompromised and diabetic patients, where special care is required due to pre-existing

comorbidities, including the possibility of fungal infections (mucormycosis and *Aspergillus*). The pathophysiological aspect of periorbital cellulitis often arises from a direct extension of an infection of the paranasal sinus, especially the ethmoidal sinus. Anatomically, the ethmoid sinus is separated from the orbital region by the lamina papyracea, a thin membrane through which blood vessels and nerves pass, allowing the etiological agent to ascend to the orbital cavity.

The clinical manifestations of periorbital cellulitis include edema, hyperemia, periorbital pain, fever, blurred vision, photosensitivity, ocular secretion, proptosis, and even restriction of ocular motility, which can affect adjacent areas such as nasal congestion and headache. When altered mental status and neck stiffness are present, more serious complications such as meningitis, cavernous sinus thrombosis, and sepsis must be considered. Both clinical practice and scientific findings indicate that treatment of periorbital cellulitis involves antibiotics, administered either orally or intravenously, depending on the severity of the infection. Possible complications include vision loss due to optic ischemia and optic neuritis, ophthalmoplegia, cavernous sinus thrombosis, meningitis, and brain abscess.

Vision loss due to ischemia and optic neuritis occurs in 3 to 11% of cases, due to increased intraorbital pressure, in addition to ophthalmoplegia caused by infection of the orbital soft tissues. However, when the local infection spreads to the intracranial cavity, meningitis, brain abscess, and cavernous sinus thrombosis may occur, which is the focus of this case report.

### Case report

This is the case of a 15-year-old male patient who sought emergency care on March 22, 2023, with complaints of headaches, nausea, vomiting, and diarrhea for two days. A COVID-19 infection was suspected, and he was advised to return in two days for a nasal swab test. On March 24, his antigen test came back negative. However, due to the persistence of headaches in the frontal and nuchal regions, improvement in diarrhea and vomiting, but the onset of ear pain (otalgia) and sore throat (odynophagia), a diagnosis of acute pharyngotonsillitis was proposed, and antibiotic therapy (Clavulin) along with anti-inflammatory medication (Ibuprofen) was prescribed for home treatment. As the days passed, the patient developed worsening headaches, fever, and swelling in the right eyelid region. On March 28, he was brought to the emergency department by a companion who reported having difficulty waking him up. Upon admission, the patient was drowsy, unresponsive, with anisocoric pupils that were non-reactive to light, desaturation, and a decreased level of consciousness, leading to the indication of orotracheal intubation. The patient was admitted to the intensive care unit already sedated, with a RASS score of -4, orotracheally intubated with a 14 cm PVC tube, PEEP of 10, respiratory rate of 14, febrile, anisocoric pupils (right pupil dilated, left pupil constricted) and without neck stiffness. A lumbar puncture was performed, and the cerebrospinal fluid culture indicated the growth of *Staphylococcus aureus*, confirming the diagnosis of acute infectious

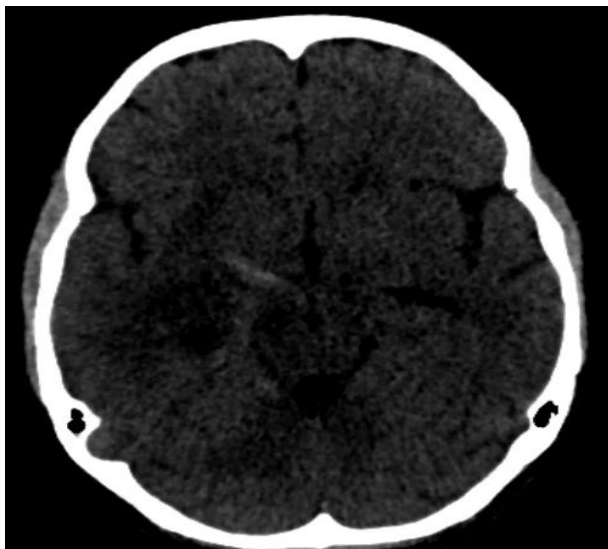
meningoencephalitis, and treatment was initiated accordingly. A contrast-enhanced cranial CT scan performed on April 6, 2023, showed signs of thrombosis in the right carotid sinus and the left ophthalmic vein, prompting further ophthalmological investigation. A contrast-enhanced CT scan of the paranasal sinuses revealed signs of right proptosis, densification of retro-orbital intraconal fat, and pre-septal fat; there was also an absence of filling in the right superior ophthalmic vein, consistent with local thrombosis. A subsequent cranial CT scan showed signs of meningitis with leptomeningeal enhancement in the parieto-occipital region, as well as extension of the thrombosis to the right cavernous sinus and cerebral vein, manifested by engorgement and lack of contrast filling. There was also evidence of segmental density increase in the right cerebral vein in the non-contrast acquisition, compatible with the rare radiological sign of a hyperdense vein; in addition to bilateral thalamocapsular hypoattenuation. Concurrently with the radiological findings, the patient exhibited restricted extrinsic ocular mobility on the right side, defining the presentation of superior ophthalmic vein thrombosis. The patient continued with neurological and ophthalmological follow-up and completed the treatment for meningoencephalitis, eventually being discharged and referred for outpatient follow-up. Two months later, the patient attended an outpatient consultation with a companion, reporting no complaints, calm, in good general condition, but with limited contact and communication difficulties. Vital signs and physical examination showed no abnormalities; he denied the onset of new symptoms, as well as improvement in those he had since the first episode, and also reported progressive neurological improvement since the day of hospital discharge.



**Figure 1:** Computed tomography of the facial sinuses, acquisitions with contrast, visualizing the presence of pre- and post-septal fat densification with proptosis on the right hemiface, in addition to faint densification of the ethmoidal cells on the same side.



**Figure 2:** Contrast-enhanced tomographic image, showing the filling failure of the superior ophthalmic vein on the right.



**Figure 3:** Computed tomography of the skull without contrast demonstrating hyperdensity of the right internal cerebral vein (hyperdense vein sign) in the non-contrast acquisition, in addition to thalamocapsular hypoattenuation representing an area of local infarction.

### Discussion

The cavernous sinus is a paired venous structure dependent on the dura mater, located at the base of the skull. Each compartment consists of a plexus of extremely fine veins and extends through the superior orbital fissure, receiving blood from the superior ophthalmic vein, inferior ophthalmic vein, middle superficial cerebral vein, and sphenoparietal sinus. Cavernous Sinus Thrombosis (CST) involves obstruction of this vessel by a clot and predominantly affects adult women. Causes include facial infections such as nasal boils, orbital cellulitis, and sphenoid/ethmoidal sinusitis. These infections can cause thrombi in the cavernous sinuses and, rarely, in surrounding vessels such as the Superior Ophthalmic Vein, as reported

in this case. CST can affect cranial nerves and lead to meningoencephalitis, brain abscesses, and stroke.

Diagnosis typically involves magnetic resonance imaging of the brain with venography; cerebral tomography and phlebography may also be useful.

The relevance of this case lies in the patient's atypical age for CST, the causative factor (orbital cellulitis), and the impact of cerebral infarction. The severity and extensive lesions resulting from septic thrombosis of the superior ophthalmic vein and cavernous sinus, as evidenced in this case, highlight the importance of the attending physician's and ophthalmologists' knowledge regarding the identification and clinical signs of central involvement, combined with the need for proper diagnostic testing.

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