Orbital infarction syndrome in a COVID-19 associated Internal carotid artery occlusion

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Research Article

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Abstract

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Main Text

A 39-year-old man presented with global aphasia and right hemiplegia of 15 hours duration. 12 days earlier, he had developed fever and tested positive for SARS-CoV-2 RT PCR. At admission, he had an NIHSS score of 18. CT brain showed a dense left MCA sign and an area of MCA infarction < 1/3rd of the MCA territory. CT angiogram (CTA) showed a left ICA petro-lacral segment occlusion [large vessel occlusion (LVO)]. MRI showed a partial MCA infarct. He was taken up for mechanical thrombectomy under local anaesthesia. DSA showed an occlusive thrombus in the supraclinoid internal carotid artery (ICA), covering the origin of the left ophthalmic artery. After 5 attempts at aspiration, the anterior cerebral artery and left M1 segments were recanalized with thrombolysis in cerebral infarction (TICI) grade 2a (partial filling [$< 2/3$ rd]) of the entire vascular territory) revascularization. Final angiographic films showed partial revascularisation of the left ophthalmic artery with very poor orbital collateral flow.

12 hours later, CT showed a completed partial MCA territory infarct. At 24 hours, he was noted to have ptosis of the left eye. Repeat CT brain showed increasing midline shift and he was taken up for decompressive craniectomy. The next day, an ophthalmological evaluation revealed tense left eyelid edema without visible inflammatory signs or orbital bruit. The left pupil was larger than the right and unreactive. There was reduced ocular tonus and conjunctival chemosis. A repeat CT showed enlargement of the muscle bellies of all 4 recti muscles of the left eye which was not seen in the pre-operative MRI. The diagnosis of an Orbital infarction syndrome (OIS) with MCA territory stroke due to a left distal ICA occlusion in the setting of COVID-19 was considered.

Orbital infarction in stroke is rare as the orbit is supplied by a rich anastomotic network of vessels. The ophthalmic artery (OA) which is the first branch of the extracavernous ICA often anastomoses with branches from the ECA ensuring that there is adequate blood supply if the ICA, ECA, or the OA are occluded. The most common anastomoses are the posterior (from the middle meningeal artery), the anterior orbit group (from branches of the ECA), and a minor medial group (arteries of the nasal cavity).[1] In a minority of individuals, the OA is the predominant orbital arterial supplier without any significant collaterals or anastomoses. In such individuals, acute occlusion of the OA can lead to occlusion of both the retinal and the choroidal circulations, (a catastrophic orbital infarction) as in our patient.

After mechanical thrombectomy (MT), an iatrogenic carotid-cavernous fistula [CCF] should be ruled out. A CCF can be distinguished by clinical and radiological features. [Table] MT itself can cause an OIS by producing embolization to new arterial territories in 2% of patients.[2][3] Aetiologies of an OIS include LVO [ICA or CCA] or dissection, temporal arteritis or other systemic vasculitis, vascular occlusion due to Mucormycosis, embolization of cosmetic fillers or particles during neuro-interventional procedures, head-trauma

and intracranial surgery.[4],[5] Mucor-mycosis complicating the post-COVID period has been reported to cause OIS.[6]

Acute ischemic stroke occurs in approximately 1.3% of patients with COVID-19. However, it is associated with higher morbidity and mortality.[7] The unfortunate combination of a prothrombotic state with COVID-19, LVO involving the OA origin, lack of revascularisation of the distal OA and the absence of adequate orbital collateralisation from the ECA branches led to this ICA occlusion producing a catastrophic OIS. Only early revascularisation of the OA can improve the outcome. Most cases are left with residual blindness although anterior ischemia and ophthalmoplegia may resolve with time.

Tables

Table. Clinico-radiological features of OIS and CCF. [8]

Features	Orbital ischemic syndrome	Carotid-cavernous fistula
Clinical features	Proptosis Blepharoptosis Acute blindness Orbital pain Total ophthalmoplegia, Anterior and posterior segment ischemia. Pale and cyanotic conjunctiva Corneal edema Clear lens with a fixed and dilated pupil Chemosis Ocular hypotony Retinal pallor Optic disc edema, optic disc pallor Severe attenuation of arteries and veins Diffuse retinal opacification	Pulsatile proptosis Orbital bruit Chemosis Conjunctival injection Subconjunctival hemorrhage Partial ophthalmoplegia Conjunctival corkscrew vessels Arterialization of episcleral veins Ocular hypertension (OHT) Fundoscopy; retinal haemorrhages, dilated retinal veins or subtle optic disc swelling
Radiological features CT/ MRI	Proptosis Retrobulbar fat stranding/edema Hyperintensity and enlargement of extraocular muscles Diffusion restriction in the optic nerve	Orbital congestion Proptosis Retrobulbar fat stranding/edema Enlargement of extraocular muscles Venous engorgement Enlarged superior ophthalmic vein Bulging cavernous sinus

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Declarations

Patient consent was obtained for the article.

Competing interests: The authors declare no competing interests.

Figures

Figure 1

Panel A. Initial axial CT showing normal orbital muscles. Panel B. DSA showing terminal ICA occlusion. Panel C. Final DSA showing partial recanalization of the left OA (white arrow). Panel D. Axial CT showing enlarged orbital muscles. Panel E. Axial T2 weighted MRI image showing enlarged orbital muscles. Panel F. Axial Diffusion weighted MRI image showing distal optic nerve diffusion restriction.