

# Ophthalmic artery occlusion combined with superior sagittal sinus thrombosis caused by hyaluronic acid injection for facial soft tissue augmentation

## A case report

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### Abstract

**Rationale:** Cosmetic hyaluronic acid injections for facial soft tissue augmentation are gaining popularity because of their convenience and favorable outcomes. Several associated complications have been described; however, ophthalmic artery occlusion (OAO) combined with superior sagittal sinus thrombosis (SSST) has been rarely reported.

**Patient concerns:** A 21-year-old woman presented with sudden loss of vision and severe pain in the left eye, right upper limb weakness, and headache immediately after hyaluronic acid injection on the left side of her forehead.

**Diagnosis:** Clinical manifestations and multimodal imaging, including spectral-domain optical coherence tomography, fundus fluorescein angiography, and digital subtraction angiography, indicated OAO and SSST.

**Interventions:** Various clinical examinations were performed, and the patient was treated by thrombolysis, corticosteroids, oxygen therapy, a formula for the nourishment of the optic nerve, and measures for improving the microcirculation.

**Outcomes:** The treatment response was closely observed. The intracerebral hemorrhages were absorbed after 2 weeks of treatment, while the clinical manifestations, including ocular pain, headache, and limb dysfunction, were gradually alleviated. However, the visual acuity in the left eye remained at no light perception.

**Lessons:** Cosmetic hyaluronic acid injection can result in emergent and catastrophic complications that require immediate treatment. Thus, the development of appropriate prevention and management protocols for such scenarios is considered crucial.

**Abbreviations:** BCVA = best-corrected visual acuity, CT = computed tomography, DSA = digital subtraction angiograph, FFA = fundus fluorescein angiography, IOP = initial intraocular pressure, OAO = ophthalmic artery occlusion, SD-OCT = spectral-domain optical coherence tomography, SSST = superior sagittal sinus thrombosis.

**Keywords:** hyaluronic acid, ophthalmic artery occlusion, soft tissue augmentation, superior sagittal sinus thrombosis, visual acuity

## 1. Introduction

Facial hyaluronic acid injections for cosmetic soft tissue augmentation are gaining popularity because of their favorable outcomes. Although they are considered safe and convenient,

some complications, such as skin necrosis, vision loss, and even cerebral infarction have been reported.<sup>[1–3]</sup> Here we present the first case, to the best of our knowledge, of ophthalmic artery occlusion (OAO) combined with superior sagittal sinus thrombosis (SSST) that developed after hyalur-

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BY and FS contributed equally to this work.

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Informed consent was obtained from the participant included in the study.

Informed written consent had been obtained from the patient.

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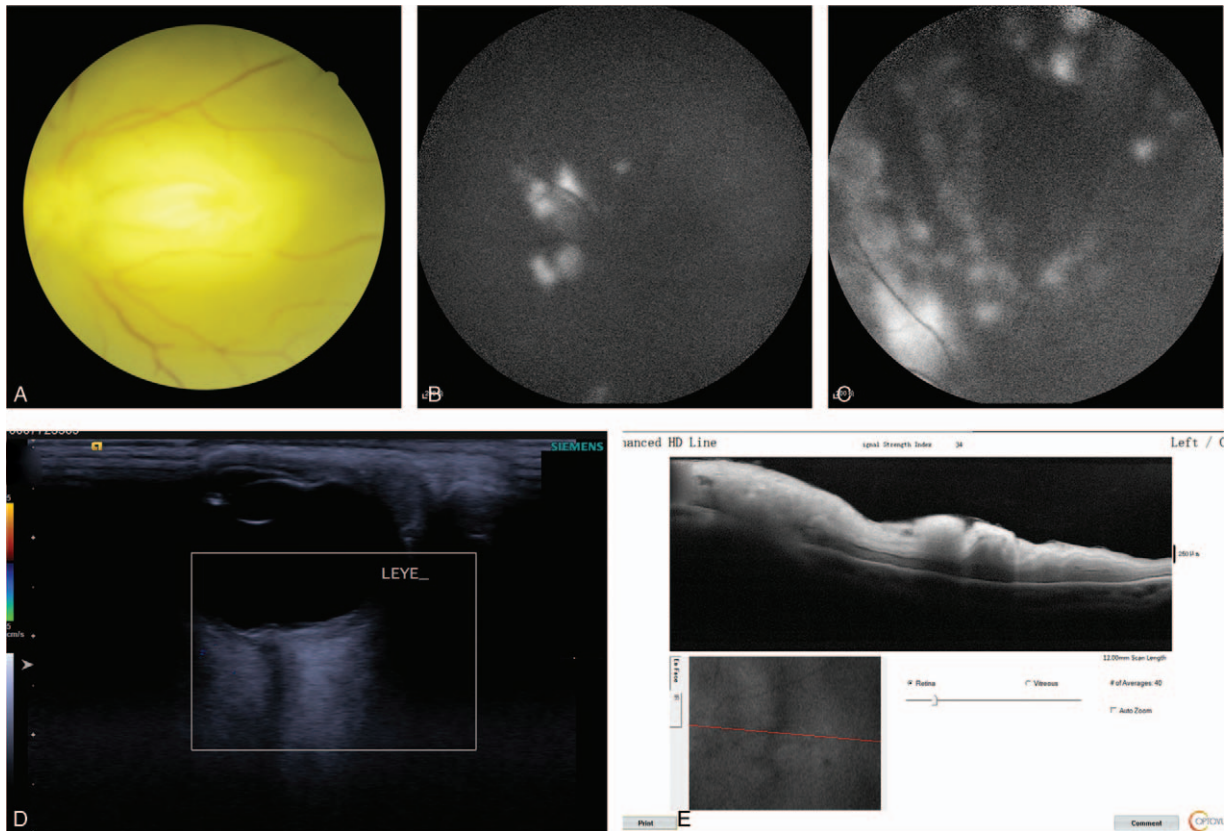
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**Figure 1.** (A) Funduscopy examination of the left eye showed a pale and swollen retina with no cherry-red spot. (B and C) Fundus fluorescein angiography (FFA) revealed no retinal or choroidal perfusion. (D) Doppler flow imaging showed absent flow in the central retinal artery and vein. (E) In spectral-domain optical coherence tomography (SD-OCT), the retinal neurosensory layer exhibited edema and thickening with a corresponding increase in reflectivity.

onic acid injection for facial soft tissue augmentation in a young woman.

## 2. Case presentation

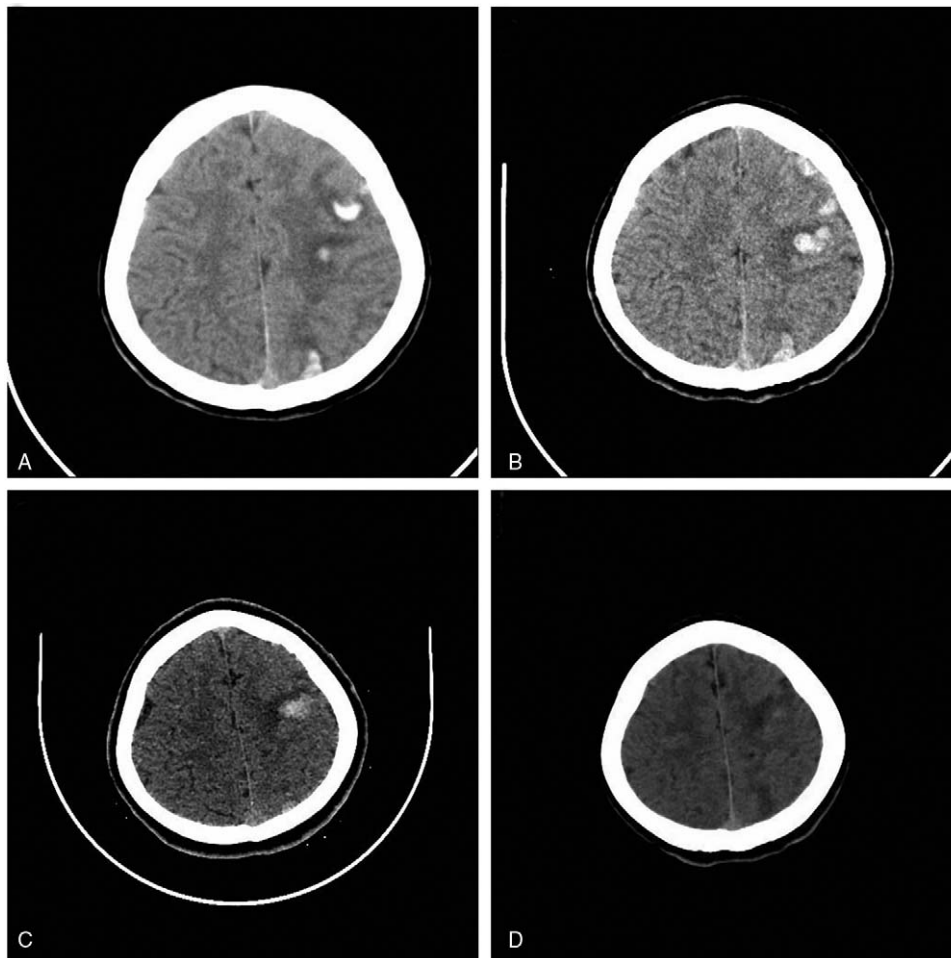
A 21-year-old Chinese woman was admitted to our hospital with sudden vision loss and severe pain in the left eye in addition to headache that developed immediately after the injection of hyaluronic acid on the left side of her forehead 2 days back. There was no pain or vision loss in her right eye. Her systemic and ophthalmic histories were unremarkable. Along with bruising on the forehead (Fig. 1A), she exhibited acute onset of right upper limb weakness with grade 2 muscle strength in the elbow, hand, and wrist. The right and left lower limbs exhibited grade 4 and grade 5 muscle strength, respectively. The right tendon reflex was absent, and there were no signs of meningeal irritation. The initial best-corrected visual acuity (BCVA) was no light perception for the left eye and 6/6 for the right eye. Ophthalmic examination revealed corneal edema, a shallow anterior chamber, and pupil dilation in the left eye. The initial intraocular pressure (IOP) was normal. Funduscopy examination of the left eye showed a pale and swollen retina with no cherry-red spot (Fig. 1B). Fundus fluorescein angiography (FFA) revealed no retinal or choroidal perfusion (Fig. 1C and D), while color Doppler flow imaging showed absent flow in the central retinal artery and vein (Fig. 1E). In spectral-domain optical coherence tomography (SD-OCT), the retinal neurosensory layer exhibited edema and thickening with a corresponding

increase in reflectivity (Fig. 1F). Initial computed tomography (CT) showed intracerebral hemorrhages in the left frontal and parietal lobes (Fig. 2A). Follow-up CT performed after 24 hours showed an increase in these hemorrhages (Fig. 2B). Digital subtraction angiography (DSA) performed under patient consent demonstrated a perfusion defect in the superior sagittal sinus (Fig. 3). On the basis of these findings, the patient was diagnosed with OAO and SSST secondary to cosmetic hyaluronic acid injection.

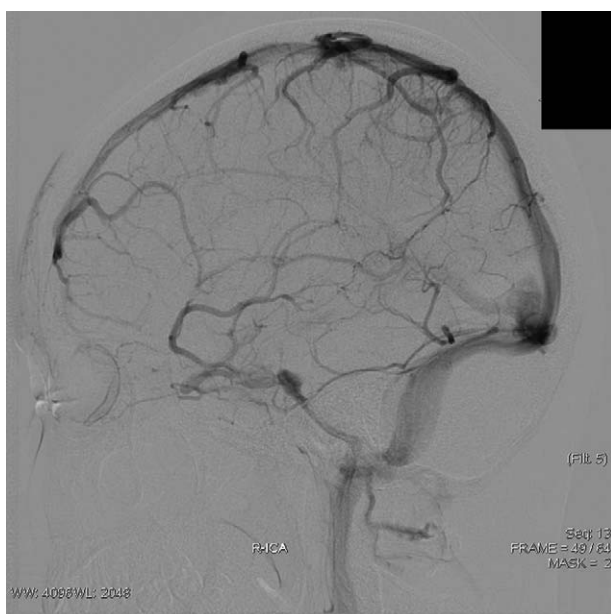
The patient was treated by thrombolysis, corticosteroids, oxygen therapy, a formula for the the nourishment of the optic nerve, and measures for improvement of the microcirculation. The treatment response was closely observed. Follow-up CT performed at 1 and 2 weeks after treatment initiation showed gradual resolution of the intracerebral hemorrhages, which were absorbed by 2 weeks (Fig. 2C and D). The clinical manifestations, including ocular pain, headache, and limb dysfunction, were gradually alleviated. The muscle strength in the right elbow and hand muscle power have been improved to Grade 4, Grade 3, respectively. Moreover, BCVA for the left eye remained at no light perception.

## 3. Discussion and conclusions

OAO is considered the most serious complication of cosmetic hyaluronic acid injection. During injection, hyaluronic acid particles form emboli that can move through blood vessels and cause retrograde blockage, thus resulting in ocular artery occlusion or cerebral artery infarction.<sup>[1-3]</sup> In the present case, the patient developed OAO with sudden vision loss and severe



**Figure 2.** (A) Initial computed tomography (CT) showed intracerebral hemorrhages in the left frontal and parietal lobes. (B–D) Follow-up CT performed at 24 hours, 1 and 2 weeks after treatment initiation showed gradual resolution of the intracerebral hemorrhages, which were absorbed by 2 weeks.



**Figure 3.** Digital subtraction angiography (DSA) demonstrated a perfusion defect in the superior sagittal sinus.

pain in the left eye after hyaluronic acid injection on the left side of the forehead. There was severe ischemia in the anterior segment and retina, with no cherry-red spot in the fovea. FFA showed no evidence of retinal or choroidal perfusion.<sup>[1]</sup> These findings are quite different from those observed in retinal or ciliary artery occlusion, and the clinical manifestations and findings of multimodal imaging indicated that OAO was associated with the lack of perfusion of the ophthalmic artery.

Acute multifocal infarcts and hemorrhagic transformation can occur secondary to cerebral infarction after hyaluronic acid injection.<sup>[2]</sup> Interestingly, CT showed intracerebral hemorrhages in the left frontal and parietal lobes with no evidence of cerebral infarction in the present case. However, DSA revealed a perfusion defect in the superior sagittal sinus, leading to a definitive diagnosis of SSST and explaining the reason for the intracerebral hemorrhages. We speculated that hyaluronic acid particles were erroneously injected into veins during administration at multiple sites. Considering the presence of the frontal vein plexus and the absence of a venous valve in the facial area, the hyaluronic acid particles could easily pass through the venous system, return to the cavernous sinus, and block the superior sagittal sinus. SSST is a rare disease with a high rate of mortality, which primarily occurs in the puerperal period or is caused by intracerebral infections.<sup>[4,5]</sup>

Complications caused by cosmetic hyaluronic acid injection require immediate treatment. However, worldwide studies have

shown that no treatments were found to be consistently successful.<sup>[6,7]</sup> Park showed that hyaluronic acid emboli could not be degraded by intra-arterial thrombolysis,<sup>[8]</sup> while Kim et al reported that hyaluronidase could degrade hyaluronic acid, although it could not improve the perfusion of the ophthalmic artery.<sup>[9]</sup> Belezna et al analyzed 98 global cases of blindness caused by filler injection and determined that the prognosis was poor.<sup>[10]</sup> Anticoagulation therapy, endovascular thrombectomy, and thrombolytics have been successfully used to treat SSST; however, high risks of increased hemorrhage and brain edema have been reported.<sup>[11,12]</sup> In the present case, the patient was treated by thrombolysis, corticosteroids, oxygen therapy, a formula for nourishment of the optic nerve, and measures for improving the microcirculation. Although the hemorrhages resolved and the clinical manifestations alleviated, the visual acuity in the left eye remained at no light reception.

Complications after hyaluronic acid injection are primarily iatrogenic, and measures for preventing these complications need to be developed.<sup>[13,14]</sup> Some suggestions were as follows. First, facial vascular anatomy should be familiar with plastic surgeons; Injection procedure should be slow and gentle with minimal pressure by using a small-diameter needle. Second, move the needle tip while injecting, so as not to deliver a high volume in one location. Aspirate before injection and the use of a cannula is recommended. Finally, be extreme cautious when injecting a patient who has undergone a cosmetic procedure in the same area.<sup>[9]</sup>

In conclusion, we described a rare case involving a young woman who developed OAO with SSST secondary to hyaluronic acid injection for facial soft tissue augmentation. The cosmetic hyaluronic acid injection can result in emergent and catastrophic complications that require immediate treatment. Thus, the development of appropriate prevention and management protocols for such scenarios is considered crucial.

### Author contributions

**Investigation:** Bangtao Yao.

**Project administration:** Xiaogui Zhao.

**Supervision:** YUHUA DING.

**Writing – original draft:** Bangtao Yao, Feifei Shen.

**Writing – review & editing:** Gang Liu, YUHUA DING.

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