CASE REPORT

Triamcinolone emboli leading to central retinal artery occlusion: a multimodal imaging study

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SUMMARY

A 19-year-old man presented with unilateral sudden onset vision loss following an intra-articular triamcinolone injection in the right temporomandibular joint. At fundus examination emboli of triamcinolone were visible in multiple retinal arteries. Choroidal ischaemia and occlusion of the central retinal artery and its branches were documented at fluorescein angiography. Optical coherence tomography revealed significant thickening of the inner retinal layers. Optical coherence tomography angiography clearly demonstrated an abrupt cut-off of flow in a vessel below the optic disc. Lack of perfusion of the superficial and deep retinal plexuses beyond the areas of embolisation and at the posterior pole was also appreciated. The visual outcome was poor despite treatment.

BACKGROUND

Central retinal artery occlusion (CRAO) is an ophthalmic emergency that carries a grave visual prognosis. This condition accounts for 1 in 10 000 patient visits to an ophthalmology outpatient department.¹ The various treatment options include sublingual isosorbide dinitrate, hyperbaric oxygen, ocular massage, intravenous mannitol and anterior chamber paracentesis.² However, the ability of the retina to recover from CRAO depends on the duration of retinal ischaemia.³ The prognosis in cases of CRAO remains poor despite the aforementioned interventions. None of these interventions, to date, have proved consistently effective in the treatment of CRAO. CRAO can rarely occur due to iatrogenic embolisation of particles of a triamcinolone suspension. In this report, we discuss the use of multimodal imaging in such an event and conduct a review of the literature of similar cases.

CASE PRESENTATION

A 19-year-old man presented to Dr Rajendra Prasad Centre For Ophthalmic Sciences describing acute, painless loss of vision from his right eye (RE), immediately following an intra-articular injection of triamcinolone acetonide in his right temporomandibular joint (TMJ), given for TMJ ankylosis. The patient was referred to a local eye care centre where a diagnosis of RE CRAO was made. The patient was managed with eye massage and hyperbaric oxygen therapy.

At the time of presentation to our centre (4 days after the acute episode) the patient had a visual acuity of hands movements close to face in the RE. The vision in the left eye was 20/20 unaided. There

was a relative afferent pupillary defect in the RE. The fundus examination of the RE revealed ischaemic retinal whitening with a cherry red spot. Multiple white emboli suggestive of triamcinolone acetonide particles could be seen in the retinal arteries and arterioles ([figure 1](#)).

INVESTIGATIONS

Fundus fluorescein angiography was performed. Well-demarcated areas of hypofluorescence in the choroid, suggestive of areas of choroidal hypoperfusion were apparent in the early phase of the angiogram. Segments of multiple retinal arteries did not show normal filling of the dye, suggestive of occlusion. The retinal vasculature distal to a large embolus seen in a branch of the central retinal artery inferior to the disc was not perfused at all ([figure 2A](#)). There was also a delay in the arteriovenous transit time. The late phase showed well-demarcated triangular areas of hyperfluorescence in the peripheral retina. The apices of the triangles were towards the equator and their base towards the ora serrata ([figure 2B](#)).

Optical coherence tomography-angiography (OCT-A) was performed from an area at the posterior pole and an area below the disc (Topcon, DRI OCT Triton). An OCT-A scan taken from the first of these ([figure 3A, B](#)) showed a large area of capillary non-perfusion at the fovea with a reduction in perifoveal capillary density of the superficial and deep retinal capillary plexus. An OCT-A scan performed at the second of these at an area where the triamcinolone emboli were evident clearly showed

Figure 1 Fundus image (montage) showing a cherry red spot with multiple areas of retinal whitening suggestive of arterial occlusions. The multiple white emboli (triamcinolone particles) in retinal vasculature can also be seen (white arrows).

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Figure 2 (A) Venous phase fluorescein angiogram showing non-perfusion of retinal vasculature distal to a large embolus in a branch of the central retinal artery inferior to the optic disc. Well-demarcated triangular areas of hypofluorescence in the peripheral retina which develop hyperfluorescence in the late phase (B) are also seen. These are suggestive of choroidal infarcts.

Figure 3 (A) The yellow rectangle represents the area of fundus included in the OCT-A scan. (B) OCT-A scan of this area reveals a large area of capillary non-perfusion at the fovea with a reduction in perifoveal capillary density of the superficial and deep retinal capillary plexus. (C) The green rectangle represents the area of fundus included in the OCT-A scan. (D) The area of embolisation is visible as a black segment (lack of flow) with abrupt termination of the vessel. The superficial and deep capillary retinal vascular networks are not visible in the involved area suggestive of a lack of perfusion beyond the emboli. (E) SS-OCT image showing increased thickness of the inner retinal layers due to the arterial block with perifoveal partial separation of the internal limiting membrane with traction at the fovea and loss of foveal contour. OCT-A, optical coherence tomography-angiography; SS-OCT, swept-source optical coherence tomography.

a lack of perfusion beyond the emboli. The embolisation of the vessel could also be seen as a linear black segment (lack of flow) at the abrupt termination of the vessel. The superficial and deep capillary retinal vascular networks were not visible in the involved area (figure 3C, D). Swept-source optical coherence tomography revealed significant thickening of the inner layers of the retina, consistent with ischaemia. There was also evidence

of perifoveal partial separation of the internal limiting membrane with traction at the fovea and loss of foveal contour (figure 3E).

TREATMENT

Ocular massage followed by anterior chamber paracentesis was performed for the patient and he was started on antiglaucoma

drugs (oral acetazolamide and topical timolol maleate). The poor visual prognosis of CRAO was explained.

OUTCOME AND FOLLOW-UP

The visual acuity had improved marginally to finger counting close to the face 24 hours later.

DISCUSSION

The majority of cases of CRAO are attributed to thrombo-embolic disease, as a result of atherosclerosis. CRAO has been previously reported to occur following intralesional steroid injection^{4–7} in the facial/eyelid region. Wong *et al*⁸ have found the mean retinal arteriolar calibre to be $144.1 \pm 14.4 \mu\text{m}$ (SD) and venular calibre $214.0 \pm 22.2 \mu\text{m}$, respectively. The particle size of triamcinolone suspension range from 1 to $1000 \mu\text{m}$.⁹ Thus, the retinal vasculature is prone to occlusion from the emboli from triamcinolone suspension. In the cases reported by Liu *et al*⁴ and Edwards,⁵ the steroid injection was given in the forehead region. CRAO has been reported following periocular steroid injection for juvenile haemangioma as well.⁶ Apart from these, it has been reported to have occurred in a healthy 12-year-old boy following a subcutaneous triamcinolone acetate steroid injection at the site of a keloid on his earlobe.⁷ The likely mechanism in these cases seems to be an inadvertent intra-arterial injection of the steroid and further flow to the choroid and retina via ophthalmic artery through retrograde flow. Liu *et al*⁴ have reported the presence of cerebral infarction along with CRAO following steroid injection to the forehead. This is possible by a retrograde flow of steroid emboli through the internal carotid artery due to a forceful injection.

Our patient was a young man who developed this condition after the supposed intra-articular injection of triamcinolone acetate for TMJ ankylosis. To the best of our knowledge, this is the first case of CRAO post intra-articular steroid injection. The fundus clearly showed the presence of triamcinolone particles in the branches of the central retinal artery. The vascular changes seen at and around the posterior pole could be well captured non-invasively by OCT-A. Fluorescein angiography of our case further revealed triangular areas in the peripheral fundus which were hyperfluorescent in the early phase and hyperfluorescent in the late phase. The apices of the triangles were towards the equator and their base towards the ora serrata. These hyperfluorescent areas in the late phase are suggestive of Amalric sign, which has been described to be a result of choroidal ischaemia associated with CRAO.^{10–11} The TMJ is supplied by the maxillary artery, which in turn is a branch of the external carotid artery. An inadvertent intra-arterial injection of the steroid and the subsequent retrograde flow of the steroid suspension appear to be the likely cause behind the development of the vascular occlusion in our case. This is possible due to the presence of high vascularity with multiple anastomoses in the face. The other possibility of an inadvertent intravenous injection followed by the emboli reaching the choroidal and retinal vasculature through the normal circulatory pathway cannot be entirely ruled out. Talc and cornstarch emboli in the eyes of intravenous drug misusers have been described after intravenous injections.¹²

Learning points

This case represents a rare but avoidable complication of an otherwise commonly performed procedure.

- Utmost care should be taken while injecting steroid suspensions as they can pass on to the systemic circulation leading to catastrophic events.
- Careful aspiration must be done before injecting in the facial areas as the intravascular injection can lead to the passage of emboli to the retinal vasculature. Injection should be as slow as possible to decrease the forces that may propel the emboli.
- Optical coherence tomography angiography is a promising non-invasive modality to study vascular changes in and around the posterior pole of the retina in such cases.

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Competing interests None declared.

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