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Orbital compartment syndrome during endoscopic drainage of subperiosteal orbital abscess☆

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ABSTRACT

Background: Orbital compartment syndrome is a rare ocular emergency requiring immediate intervention to prevent vision loss. It can arise due to a variety of causes including trauma, neoplasms and retrobulbar hemorrhage during endoscopic sinus surgery. Lateral canthotomy and inferior cantholysis is a well-known therapeutic procedure to rapidly relieve raised intraocular pressures.

Case report: We report a case of a subperiosteal orbital abscess due to acute maxillary sinusitis that underwent endoscopic drainage. Intraoperatively, he developed raised intraocular pressure following irrigation of the maxillary sinus and manual pressure on the malar abscess, necessitating emergent lateral canthotomy and inferior cantholysis.

Conclusion: To our knowledge, this is the first reported case of orbital compartment syndrome following sinonasal irrigation and malar pressure in the English literature. This case will serve as a reminder to the sinus surgeon of the potential danger of transmitted pressure from the paranasal sinus or malar soft tissue into the orbital compartment.

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1. Introduction

Subperiosteal orbital abscess is an infective post-septal orbital complication seen in acute rhinosinusitis. While patients with milder symptoms may improve with conservative management, refractory cases of subperiosteal orbital abscess usually require drainage. Surgical approaches include external, endoscopic or a combination of both. We report a case of a subperiosteal orbital abscess due to acute maxillary sinusitis that underwent endoscopic drainage. Intraoperatively, he developed raised intraocular pressure following irrigation of the maxillary sinus and manual pressure on the malar abscess, necessitating emergent lateral canthotomy and inferior cantholysis. An extensive search on PubMed revealed no prior reported cases of orbital compartment syndrome arising following sinonasal irrigation. To the best of our knowledge, this is the first-ever reported case of such an occurrence in the English literature.

2. Case report

A 56-year old Chinese gentleman with a history of suboptimally controlled type II diabetes mellitus presented in September 2014 with two weeks of right orbital pain and ipsilateral hemifacial swelling. While this was associated with intermittent purulent rhinorrhea, the patient denied any visual blurring or excessive tearing. Examination revealed right periorbital swelling and erythema with exquisite tenderness on palpation (Fig. 1). There was no proptosis or chemosis and the range of extra-ocular muscle movements was full. Testing for relative afferent pupillary defect was negative and

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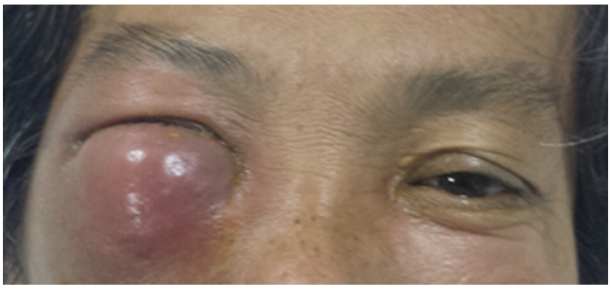

Fig. 1 – Pre-operative physical examination revealed right periorbital swelling and erythema.

visual acuity testing was normal. Nasoendoscopy revealed a congested right middle meatus with otherwise no frank mucopus or secretions.

The patient underwent computed tomography (CT) scan of the paranasal sinuses and orbits. Together with elevated inflammatory markers (white cell count of 15,100 cells per microliter, and C-reactive protein level of 45.9 milligrams per liter), the CT scan showed right maxillary sinusitis with concomitant right ethmoidal and frontal sinus opacification. Erosion of the anterosuperomedial wall of the right maxillary sinus with a resultant inferomedial subperiosteal orbital abscess was seen. Additionally, an adjoining right malar soft tissue abscess was also noted (Fig. 2). The right orbit was otherwise intact with no intraconal collection.

When his condition failed to improve after 24 hours of intravenous amoxicillin-clavulanic acid and strict diabetic control, ophthalmology input was sought again with a view for external drainage of the malar abscess combined with endoscopic drainage of the diseased maxillary sinus. However, the ophthalmologist opined that a percutaneous incision could be avoided by applying digital pressure to the area to channel its contents into the maxillary sinus during endoscopic drainage. Thus, a decision was made for endoscopic drainage of the subperiosteal orbital abscess.

Intraoperatively, the patient was noted to have right maxillary, ethmoidal and frontal sinusitis with abundant mucopus. An inferomedial subperiosteal abscess coursing along the floor of orbit which communicated with the maxillary sinus via a dehiscence in its roof was noted. After drainage of the abscess and ventilation of the maxillary sinus, digital pressure at the right malar area was applied to facilitate drainage of the soft tissue abscess. The anterior ethmoid artery was preserved during surgery. Subsequently, the right maxillary sinus cavity was flushed copiously with normal saline. During this, a sudden increase in orbital swelling was noted with a tense and bulging orbit (Fig. 3). An urgent ophthalmology review was sought and tonometry confirmed orbital compartment syndrome with raised intraocular pressures of 40 mmHg on rapid sequential testing. A decision was made for emergent lateral canthotomy and inferior cantholysis. Exploration was then attempted but no bleeding source could be identified post-release. Repeat tonometry now showed a marked reduction to 22 mmHg on repeated testing. Gradual resolution of the orbital swelling ensued.

Post-operatively, tonometry pressures remained normal with no clinical evidence of optic neuropathy. The lateral canthotomy and inferior cantholysis were repaired on post-operative day 3. Medical treatment persisted and the patient was discharged well a week later with no visual deficits. However, his orbital swelling did not resolve completely upon discharge. On postoperative day 12, he had a recurrence of the right malar abscess (Fig. 4). The abscess was drained with a small stab incision under local anesthesia and resolved with intravenous amoxicillin-clavulanic acid and daily flushing of the wound with subsequent ribbon gauze packing. The abscess cavity healed and the wound was subsequently closed with secondary suture. He remains well at the ninth-month post-operative review with imperceptible lateral canthotomy scar (Fig. 4).

3. Discussion

Orbital complications of paranasal sinus disease are uncommon but potentially devastating. In 1970, Chandler et al. classified infective orbital complications of sinusitis into five types: preseptal cellulitis, orbital cellulitis, subperiosteal

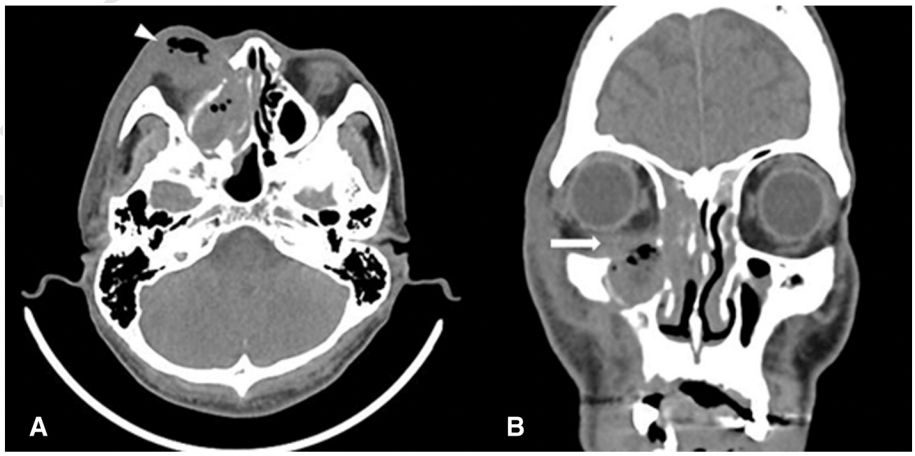

Fig. 2 – (A) Axial CT cut showing maxillary and ethmoidal sinusitis and adjoining right malar soft tissue abscess (white arrowhead). (B) Coronal CT cut showing right maxillary, frontal and ethmoidal sinusitis with inferomedially based subperiosteal abscess (white arrow).

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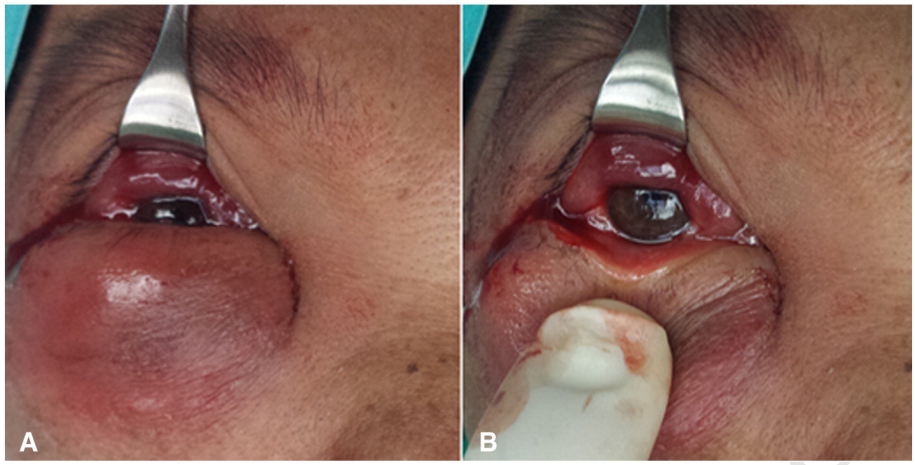

Fig. 3 – Tense and bulging orbit (A) with evident chemosis and proptosis (B) noted during periorbital massage and flushing of the right maxillary sinus.

abscess, orbital abscess and cavernous sinus thrombosis [1]. With an estimated incidence of 33% to 56%, subperiosteal abscess is the most commonly seen post-septal orbital complication of sinusitis [2,3]. It occurs when bacterial infection spreads from the paranasal sinuses, most often from the ethmoid sinus through the thin lamina papyracea of the medial orbital wall. The drainage of the eyelids and sinuses is largely mediated via the superior and inferior orbital veins that drain into the cavernous sinus. A valveless venous system, it allows for spread of infection, causing sight-threatening complications such as cavernous sinus thrombosis. Management of an established subperiosteal abscess involves prompt ophthalmology consult with clear and objective assessment of proptosis, orbital pressure, visual acuity, color vision and eye movements. Evidence of an established abscess on the radiological imaging and absence of clinical improvement after 24–48 hours of intravenous antibiotics are indications for orbital exploration and drainage [4]. Additionally, it is further recommended that concomitant drainage of the inciting diseased paranasal sinus should be performed [4].

Orbital compartment syndrome is a rare ocular emergency requiring immediate intervention to prevent vision loss. Normal intraocular pressures range from 10–21 mmHg [5]. Tonometry demonstrating intraocular pressures above 21 mmHg suggests ocular hypertension in the presence of intact vision, healthy optic disc and normal visual field, and orbital compartment syndrome if vision is threatened [6]. The most common etiologies causing an acute rise in orbital pressure include intraconal orbital infections and retrobulbar hemorrhage from trauma, surgery, and retrobulbar anesthesia [7]. Decompression of the orbit with emergent lateral canthotomy and inferior cantholysis is the most commonly performed therapeutic procedure. By decreasing the resistance to the anterior displacement of orbital contents, it decreases orbital pressure. Yung et al. reported a mean reduction of 14.2 mmHg via lateral canthotomy and a further 16.2 mmHg via subsequent inferior cantholysis [8]. In a cadaveric study by Oester et al. in 2013, lateral canthotomy and cantholysis was found to lower the pressure by an average of 56 mmHg cumulatively [9].

While atypical causes of orbital compartment syndrome have been reported, including cases due to trauma, autoimmune diseases and even severe burns, an extensive English Literature search on PubMed revealed that our patient is the first-ever report of orbital compartment syndrome occurring after sinonasal irrigation and digital pressure on the malar area during endoscopic drainage of subperiosteal abscess [10–12]. A study by Osuagwu et al. found that intraocular pressures increased following eye-rubbing but were negligible with variations below 1 mmHg [13]. In our patient, no direct pressure was exerted on the globe and the inciting event for the sudden raise in ocular pressure was not clearly discernible but likely contributed by multiple factors including ongoing inflammation, digital massage of the peri-orbital tissues and copious flushing of the maxillary sinus with its dehiscent roof. In view of such, we recommend gentle irrigation when

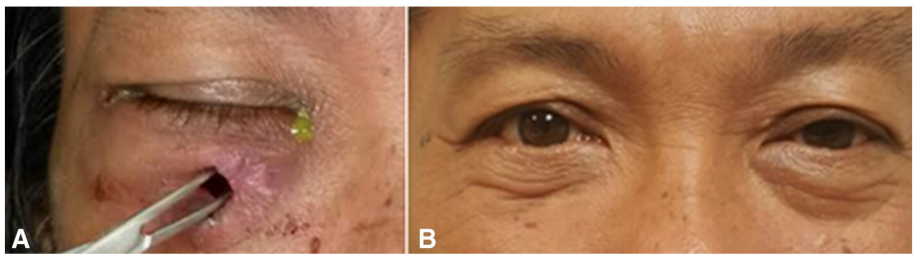

Fig. 4 – (A) Reaccumulation of right malar abscess necessitating drainage under local anesthesia. (B) Patient was well at post-operative ninth-month with no vision loss, ectropion or scarring.

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there is a known communication between the orbit and the sinus, frequent intraoperative palpation and careful observation of the eye during sinus irrigation and avoidance of excessive pressure on periorbital tissues to prevent the occurrence of orbital compartment syndrome. Established abscesses in the malar region should be separately drained via an external incision. This reduces the need for digital manipulation and pressure on periorbital tissues and mitigates the risk of abscess reaccumulation should the communication between the sinus and malar abscess close off, as was probably the case in our patient, who had a reaccumulation of his malar abscess.

In the management of orbital compartment syndrome, a high index of suspicion, prompt diagnosis and early ophthalmology involvement are of paramount importance. Surgeon decisiveness to undertake aggressive sight-saving measures such as lateral canthotomy and inferior cantholysis must be emphasized. As illustrated in our case, cosmetically acceptable results can be achieved while preventing vision loss during lateral canthotomy and inferior cantholysis.

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