Branch retinal artery occlusions after balloon sinuplasty due to formation of a traumatic pseudoaneurysm in the internal carotid artery and embolization treatment

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A 62-year-old female with no significant past medical history underwent an elective outpatient balloon sinuplasty of the right frontal sinus and bilateral sphenoid sinuses. Shortly after the balloon sinuplasty device was inflated in the left sphenoid sinus, acute, severe, pulsatile bleeding was encountered from the posterior wall of the sinus. The patient underwent emergent catheter angiography and a traumatic pseudoaneurysm was noted in the left internal carotid artery that required endovascular embolization. After the procedures, the patient’s visual acuity was 20/40 in the right eye and 20/200 in the left eye. The pupil exam revealed a left relative afferent pupillary defect. Visual field testing showed a central scotoma and an inferior nasal quadrant defect in the left eye. On fundus exam, there were multiple retinal emboli seen with ischemic retinal whitening in the left superior macular and superior temporal segments consistent with multifocal branch retinal artery occlusions in the left eye.

Conclusions and Importance: The dilation of paranasal sinuses using a balloon instrument is a fairly new technique in the surgical management of chronic sinonasal inflammatory disease, and serious adverse effects have not been widely reported. To our knowledge, this is the first case of multifocal branch retinal artery occlusions due to a traumatic internal carotid artery pseudoaneurysm and endovascular treatment after balloon sinuplasty to be reported in the English language ophthalmic literature.

1. Introduction

Dilation of the paranasal sinuses using an intraoperative balloon can treat chronic sinonasal inflammatory disease. The use of balloon sinuplasty was first approved by the FDA and introduced into clinical practice in 2005. As seen in Fig. 1, the high-pressure balloon dilates the sinus mucosa and creates microfractures in the bone around the sinus ostia to widen the outflow tract.1

We describe a case of multifocal branch retinal artery occlusions (BRAO) following endovascular treatment of a traumatic left internal carotid artery (ICA) pseudoaneurysm caused by an elective balloon sphenoid sinuplasty. To our knowledge, this is the first such case to be reported in the English language ophthalmic literature.

2. Case report

A 62-year-old female with no significant past medical history underwent an elective outpatient balloon sinuplasty of the right frontal sinus and bilateral sphenoid sinuses. She had had a prior bilateral frontal, sphenoid, and maxillary balloon sinuplasty and anterior ethmoidectomy performed two years prior with no complications. However, she continued to experience recurrent bouts of sinusitis and chose to undergo a repeat sinus septoplasty with balloon dilatation. She was not taking any medications.
A balloon sinuplasty device (Entellus XprESS LoProfile) was advanced to the right frontal recess that was partially obstructed with edematous mucosa. The balloon was inflated for 10 seconds, then deflated and removed. The left frontal recess was then visualized and found to be patent and disease free. The balloon device was then bent to the appropriate shape and passed to the right sphenoid ostium, which was stenotic. The balloon was advanced into the sinus and dilated for 10 seconds. The left sphenoid ostium was identified and was also stenotic with thick mucoid secretions obstructing the ostium. The balloon was then advanced into the left sphenoid sinus and inflated. Acute, severe, pulsatile bleeding was immediately encountered from the posterior wall of the sphenoid sinus. Further exploration revealed an arterial source of bleeding and exposed a clear bony dehiscence in the sphenoid bone.

She was immediately transferred to a nearby hospital while under sedation. She underwent emergent catheter angiography and endovascular embolization of the left sphenopalatine artery with platinum coils and non-adhesive liquid embolic agent (Onyx) comprised of EVOH (ethylene vinyl alcohol) copolymer dissolved in DMSO (dimethyl sulfoxide). A traumatic pseudoaneurysm was noted in the left ICA and a second endovascular treatment resulted in complete occlusion of the clinoid segment of the left ICA proximal to the origin of the left posterior communicating artery (Fig. 2).

Upon regaining consciousness after the sinuplasty and embolization procedures, the patient complained of blurred vision in the left eye and was seen by an ophthalmologist. She had a visual acuity of 20/40 in the right eye (OD) and 20/200 in the left eye (OS). The pupil exam revealed a left relative afferent pupillary defect. Visual field testing showed a central scotoma and an inferior nasal quadrant defect OS. Anterior segment examination and ocular motility exams were normal in both eyes (OU). Intraocular pressure was 24 mm Hg OD and 25 mm Hg OS. On fundus exam, there were multiple retinal emboli in the left superior vascular arcade with adjacent retinal whitening of the superior macula.
and superotemporal retina consistent with multifocal embolic branch retinal artery occlusions in the left eye (Fig. 3).

3. Discussion

Adverse effects associated with balloon sinuplasty procedures are relatively uncommon. In a retrospective study of over 1000 patients, Bolger et al. confirmed the efficacy of the balloon sinuplasty procedure in relieving sinus ostial obstruction and reported no major complications associated with the use of these balloon catheters. A select portion can be severe, however. In a retrospective analysis of complications from balloon sinuplasty, 114 patients (between 2006 and 2014) suffered injuries to the skull base or the orbit or experienced severe epistaxis (usually related to sphenoid sinus ostial dilation). The ICA is located in the lateral wall of the sphenoid sinus and often protrudes into the sinus. Moreover, in the majority of patients, the bony wall covering the ICA may be absent or very thin and may therefore fail to properly protect the vessel during balloon sinuplasty. In some patients with a pre-existing (or post-surgical) bone dehiscence, the only separation between the ICA and sphenoid sinus is dura and mucosa. Our patient had a pre-existing bone dehiscence in the sphenoid bone which may have contributed to the to the formation of the traumatic pseudoaneurysm upon inflating the balloon. Theoretically, balloon sinuplasty can result in a traumatic dissection or false lumen of the intracranial or intraorbital vasculature, direct optic nerve injury (particularly in sphenoid sinus surgeries given the proximity to the nerve), dural tears with bony fragments, or visual loss due to retinal emboli.

Retinal emboli can be caused from the pseudoaneurysm itself or endovascular treatment of the complication, and there are rare cases of retinal ischemia after embolization of cerebral aneurysms reported in the literature.

Ophthalmologists should be aware of the potential for visual loss after balloon sinuplasty. To our knowledge, this is the first case of multifocal BRAO to be reported in the English language ophthalmic literature due to a traumatic ICA pseudoaneurysm from sphenoid balloon sinuplasty and endovascular treatment of the complication.

Patient consent

Patient consent was not obtained as the article does not contain any personal information that could lead to the identification of the patient.

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Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Declaration of competing interest

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