Oculocardiac Reflex Elicited During Debridement of an Empty Orbit

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ABSTRACT

87 yo male with history of hypertension and right periorbital basal cell carcinoma s/p previous right total ethmoidectomy, right maxillary antrostomy, and complete right orbital exenteration for basal cell carcinoma invading the right ethmoid sinus. Functional endoscopic sinus surgery and orbital exploration was scheduled for excision of recurrent basal cell carcinoma. Rapid sequence induction and intubation was uneventful. During right orbital base curettage, the patient experienced several precipitous episodes of profound bradycardia or brief asystole. After surgery, the patient denied cardiac symptoms, and cardiac enzymes were all normal. Oculocardiac-mediated bradyarrhythmias are rarely elicited from empty orbits.

CASE REPORT

The patient was an 87-year-old man (61-kg, 165-cm) with history of hypertension, gastro-esophageal reflux disease, thyroid cancer, parotid cancer, and right periorbital basal cell carcinoma of skin with invasion of the ethmoid sinuses. The patient had a complete right orbital exenteration, right total ethmoidectomy, and right maxillary antrostomy one year prior. The patient presented for functional endoscopic sinus surgery and right orbital exploration for excision of basal cell carcinoma invading into the ipsilateral ethmoid sinus. His medications included omeprazole, levothyroxine, amlodipine, and aspirin and he was allergic to levaquin. Physical examination was unremarkable except for the post-surgical changes of the head. A preoperative electrocardiogram (ECG) was normal with a sinus rate of 70 beats per minute (bpm).

Bag-mask ventilation was anticipated to be impossible due to the right maxillary antrostomy; consequently rapid sequence induction of general anesthesia was performed with fentanyl, lidocaine, propofol, and succinylcholine. The trachea was intubated and anesthesia was maintained with sevoflurane. The heart rate remained stable at around 70 bpm until approximately one hour into the procedure when a brief episode of asystole was noted for approximately 5 seconds during curettage of the base of the right orbit in proximity to the stump of the optic nerve (**figure 1**). Normal sinus rhythm was restored without intervention, but bradycardia at approximately 20 bpm recurred associated with curettage of the orbital base. The heart rate again returned to 60 bpm without intervention. Another episode of bradycardia to approximately 20 bpm was observed a few minutes later temporally-associated with additional curettage at the base of the right orbit. OCR was suspected as the cause of the bradycardia so the anesthetic depth was increased to attenuate the reflex, from an end-tidal sevoflurane concentration of 1.4% to 2.3%. Traction upon the optic nerve stump was still able to provoke an abrupt and transient 10 bpm deceleration of the heart rate despite the increased depth of anesthesia. The remainder of the procedure including emergence from general anesthesia and tracheal extubation were unremarkable. After surgery, the patient denied cardiac symptoms. Three sets of cardiac enzymes were negative, and the patient was discharged the following morning.

DISCUSSION

The oculocardiac reflex (OCR) is a well-described cardiac depressor reflex that may result in significant cardiac rate or rhythm changes including sinus and junctional bradycardia, heart block or asystole.³ Therefore, OCR can have profound hemodynamic consequences resulting in morbidity or mortality.^{4,5} The OCR is classically depicted as being precipitated by traction on the extraocular muscles or pressure on the globe. The stretch receptors in these structures are innervated by the ciliary nerves that form the ciliary ganglion, which in turn contributes to the ophthalmic branch of the trigeminal nerve. These afferent pathways converge in the sensory nucleus of the trigeminal nerve. The efferent pathway of the OCR is mediated by the motor nucleus of the vagus nerve resulting in the negative chronotropic and dysrhythmic effects on the heart (**figure 2**).⁶

A similar reflex has been reported without the prerequisite manipulation of areas innervated by the ophthalmic branch of the trigeminal nerve. Reflex bradycardia may be seen during maxillary osteotomy or maxillary advancement during Le Fort I osteotomy,⁷ soft tissue manipulation near the mandible,⁵ and procedures near the skull base.⁸ The OCR may be a subset of a more encompassing trigeminocardiac reflex.^{9,10}

We report the OCR resulting in episodes of profound bradycardia and brief asystole during manipulation within a previously eviscerated empty orbit. There have been numerous reports describing the OCR during procedures on the eye where orbital structures are intact, but only one prior report of the OCR during a procedure involving a previously enucleated orbit to our knowledge.¹¹ OCR from direct manipulation of the optic nerve is an unusual feature of this report, but it is consistent with reports of OCR precipitated by optic nerve clamping during enucleation.¹²

The occurrence of the OCR in the empty orbit demonstrates that orbital structures containing stretch receptors are not required for initiation of the OCR. Therefore, patients remain at risk for OCR during subsequent procedures involving the orbit even after enucleation or during fitting of an ocular prosthesis.

Figure 1: View of the empty orbit, the stump of the optic nerve and a suture on the ophthalmic artery are visible.

Figure 2: Oculocardiac Reflex Pathway

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INTRODUCTION:

The oculocardiac reflex (OCR) is a well-described cardiac depressor reflex that may result in significant cardiac rate or rhythm changes, sinus and junctional bradycardia, heart block or asystole. It is also known by the eponym Aschner-Dagnini Reflex, being independently reported in 1908 by both Guiseppe Dagnini and later Bernard Aschner.^{1,2} The OCR is classically depicted as being precipitated by traction on the extraocular muscles or pressure on the globe. The ophthalmic branch of the trigeminal nerve serves as the afferent pathway and the vagus nerve as the efferent pathway. We report the OCR resulting in episodes of profound bradycardia and brief asystole during manipulation within a previously enucleated empty orbit.