Asystole during Le Fort 1 osteotomy: the trigeminovagal reflex

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ABSTRACT

The trigeminovagal reflex is a phenomenon that occurs rarely during maxillofacial surgery. Previously described as the oculocardiac reflex, this reflex can occur during ocular and periocular surgery. To be more anatomically precise, it was renamed the trigeminocardiac or trigeminovagal reflex, since stimulation of any part of the trigeminal nerve can elicit this reflex arc. We describe a case of asystole during mobilization of a maxilla following a Le Fort 1 osteotomy.

KEYWORDS

Trigeminovagal – Trigeminocardiac – Oculocardiac – Reflex – Osteotomy

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Introduction

The trigeminovagal reflex is a known brainstem reflex that occurs rarely during maxillofacial surgery. When it does occur, it can lead to severe bradycardia and even cardiac arrest, with the need for intraoperative resuscitation. Bernard Aschner first described the oculocardiac reflex in 1908 as a variant of the trigeminovagal reflex that can occur during orbital and periorbital surgery.¹ Because the reflex is not limited to the ophthalmic branch, Shelly and Church suggested changing the name to the trigeminocardiac or trigeminovagal reflex, to be more anatomically descriptive.² The trigeminal nerve is the largest cranial nerve, and stimulation of any branch can elicit the trigeminovagal reflex, leading to vagal stimulation via a reflex arc. We describe a case of asystole during mobilization of the maxilla following Le Fort 1 osteotomy down fracture.

Case history

A 45-year-old man underwent a bimaxillary osteotomy procedure, Le Fort 1 advancement and bilateral sagittal split osteotomy, for correction of his class 3 skeletal relationship. The maxillary advancement was set at 8mm, a reasonably significant Le Fort 1 forward movement. The osteotomy cuts were undertaken and down fracture was uneventful. During mobilization of the maxilla with the Rowe's dis-impaction forceps, however, the anaesthetist alerted the team that the patient was severely bradycardic and appeared to be experiencing a peri-arrest. A cardiac arrest call was made and commencement of cardiac compressions

was anticipated. The maxilla was immediately released from the dis-impaction forceps, halting any forward mobilisation of the maxilla, with subsequent rapid return of normal cardiac activity. The lead surgeon and anaesthetist at the time confirmed that the event occurred during mobilization of the maxilla and proceeded cautiously to complete the operation uneventfully. The patient was monitored closely postoperatively; no further cardiac events were reported, and the recovery period was uneventful.

Discussion

The trigeminovagal reflex is a reflex response of bradycardia, hypotension and increased gastric motility following stimulation of the trigeminal nerve. Mechanical stimulation such as stretching, compression, movement or pressure along any part of the trigeminal nerve (intracranial or extracranial) can trigger this reflex arc. Some authorities suggest the trigeminovagal reflex is an example of a group of oxygen-conserving reflexes, whereby the brain can protect itself from ischaemia by endogenous physiological mechanisms.³ Under certain circumstances, an exaggerated trigeminovagal reflex can cause potential risk to the patient.

The pathophysiology of the reflex has been described with a classic afferent arm and efferent arm.⁴ The afferent arm of the trigeminovagal reflex is the sensory nerve branches of the trigeminal nerve, which send neuronal signals via the Gasserian ganglion to the trigeminal sensory nucleus in the brainstem. The afferent reflex arm is connected to the efferent pathway via the short internuncial

fibres in the reticular formation, connecting the trigeminal sensory nucleus to the motor nucleus of the vagus nerve. Preganglionic parasympathetic efferent fibres arise from the motor nucleus of the vagus nerve and terminate on the myocardium, causing the vagus-mediated negative chronotropic and inotropic responses on the heart (Fig 1). The authors believe that stretching of the palatine nerves and possibly the superior alveolar nerves may have triggered the trigeminovagal reflex in this case.

Previous descriptions of the trigeminovagal reflex during maxillofacial procedures have been described. Such procedures include elevation of fractured zygoma, ocular surgery, temporomandibular joint surgery and transnasal surgery. Maxillofacial surgeries have been classified into low, medium and high risk of experiencing the trigeminovagal reflex,⁵ and preventative methods have been described (Table 1).

It is prudent for all maxillofacial surgeons to be aware of the trigeminovagal reflex, which is not limited to the

Table 1 Classification of surgical risk factors		
Risk	Surgery	Prevention
Low	Insufflation of temporomandibular joint Le Fort I osteotomy Elevation of zygomatic fractures	Informing anaesthetist directly before the time of highest risk
Medium	Skull base surgery	Informing the anaesthetist directly before the time of highest risk
High	Ophthalmic surgery Strabismus surgery Orbital exenteration Fractures in children with cardiac disease	Informing the anaesthetist directly before the time of highest risk Atropine and/or glycopyrrolate ketamine for anaesthetic induction

ocular pathway (oculocardiac reflex). This reflex can occur during any procedure where a section of the trigeminal nerve is subjected to stimulation. Alerting the anaesthetist preoperatively and intraoperatively will reduce the risk of potentially severe adverse outcomes should a trigeminovagal reflex be triggered.

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