

The Doyle–Saleh blink reflex

P W DOYLE¹, I BEEGUN², H A SALEH²

Departments of ¹Anaesthesia, and ²ENT Surgery, Charing Cross Hospital, Imperial College Healthcare NHS Trust, London, UK

Abstract

Objectives: When performing septoplasty or septorhinoplasty, we have observed that patients blink on injection of local anaesthetic (lidocaine 1 per cent with adrenaline 1:80 000) into the nasal mucosa of the anterior septum or vestibular skin, despite appropriate general anaesthesia. This study sought to quantify this phenomenon by conducting a prospective audit of all patients undergoing septoplasty or septorhinoplasty.

Methods: Patients were observed for a blink reflex at the time of local anaesthetic infiltration into the nasal vestibule. Also measured at this point were propofol target-controlled infusion levels, remifentanyl rate, bispectral index, blood pressure, heart rate, pupil size and position, and patient movement.

Results: There were 15 blink reflexes in the 30 patients observed. The average bispectral index value was 32.75 (range, 22–50) in the blink group and 26.77 (range, 18–49) in the non-blink group. No patients moved on local anaesthetic injection.

Conclusion: The blink reflex appears to occur in 50 per cent of patients, despite a deep level of anaesthesia. Without an understanding and appreciation of the blink reflex, this event may result in a request to deepen anaesthesia, but this is not necessary and surgery can proceed safely.

Key words: Blink Reflex; Nasociliary Nerve; Septoplasty; Rhinoplasty

Introduction

Surgery encompasses both the operation and the peri-operative machinations, including an appropriate depth of anaesthesia for the particular surgery. In nasal surgery, anaesthetists often maintain a hypotensive level of anaesthesia to help facilitate a bloodless field for the surgeon. Despite a deeper than normal level of anaesthesia and/or analgesia for surgery, occasionally patients still respond to surgical stimulation. We report here our experience of ‘abnormal’ patient responses to the injection of local anaesthetic and adrenaline during septorhinoplasty surgery.

On previous occasions, when performing nasal surgery (septoplasty and/or rhinoplasty) under general anaesthesia, in American Society of Anesthesiologists physical status classification 1–2 patients, we have observed that on injection of local anaesthetic (lidocaine 1 per cent with adrenaline 1:80 000) into the nasal mucosa of the anterior septum or vestibular skin in particular, the patient can begin ‘blinking’. This was quite disconcerting for the surgeon. Although we routinely practise hypotensive anaesthesia (systolic blood pressure 80–90 mmHg) with propofol and remifentanyl for these procedures, the anaesthetist’s first inclination was to further deepen the anaesthesia and increase the remifentanyl dosage. Despite doing this, the ‘blinking’

continued on the next injection. In addition, the Bispectral Index Sensor cerebral function monitor (BIS; Datex-Ohmeda, Hatfield, UK), used to gauge the depth of anaesthesia and recommended for total intravenous anaesthesia, showed a value consistent with deep anaesthesia (bispectral index value of less than 20).

Examination during the injection revealed that the eyes were central, with small pupils. This again suggested an adequate depth of anaesthesia, and there was no reaction to the injection apart from the ‘blink’. Despite a deep state of anaesthesia and pain relief (we use target-controlled infusions of propofol and remifentanyl), the ‘blinking’ continued until the anterior nasal mucosa or tip was anaesthetised with the local anaesthetic. There was subsequently no further blink response to surgical stimulation, and there was certainly no other movement of the patients.

Anecdotally, other ENT teams have observed this phenomenon. We sought to quantify this occurrence by conducting a prospective audit of all our patients undergoing septorhinoplasty surgery.

Materials and methods

We conducted a prospective audit of our practise. All patients were notified that they were part of an audit and verbal consent was obtained. Patients received

the standard anaesthetic for this type of surgery, administered by the first author (PD). For rhinoplasty patients, this consisted of the induction and maintenance of anaesthesia with propofol 2 per cent at a target-controlled infusion rate, aiming for 4–6 µg/ml and remifentanyl 0.1–0.3 µg/kg/minute. For septoplasty patients, anaesthesia was maintained with sevoflurane. Target systolic blood pressure was 80–100 mmHg.

The airway was maintained with a laryngeal mask, and all patients were ventilated to maintain an end-tidal carbon dioxide level of 4–5 kPa. The bispectral index value aimed for was always less than 60, the recommended level being less than 60 for surgical anaesthesia. The skin of the mucosa was sprayed with lidocaine 4 per cent and phenylephrine. The patients' eyes were always 'untaped' to allow a symmetrical view of the face for the surgeon (our normal practice).

After draping and cleaning the patient, the surgeon (HS) injected lidocaine 1 per cent with 1:80 000 adrenaline into the vestibular skin and anterior mucosa of the septum. Patients were observed for a blink reflex at this point. Also measured at this point were propofol target-controlled infusion levels, remifentanyl rate, bispectral index if a BIS monitor was applied, blood pressure, heart rate, pupil size and position, and patient movement.

Anaesthesia and surgery commenced as normal.

Results

Thirty patients were observed, 20 females and 10 males. Average age was 34 years and average weight was 68.8 kg. Twenty-three patients were American Society of Anesthesiologists physical status classification 1 and seven were classification 2 (four asthmatics, one type II diabetic, one hypothyroid patient and one patient with pemphigoid). No patients had any neurological disease. Six patients underwent septoplasty surgery with sevoflurane and fentanyl as anaesthetics, and 24 underwent rhinoplasty or septorhinoplasty surgery with target-controlled infusions of propofol and remifentanyl.

The average target-controlled infusion level was 3.95 µg/ml for propofol and 0.17 µg/kg/minute for remifentanyl. The average sevoflurane minimum alveolar concentration was 1.27.

There were 15 blink reflexes (50 per cent) in total. Two (33 per cent) occurred in the sevoflurane group and 13 (54 per cent) occurred in the target-controlled infusion group. There was no difference in systolic blood pressure (84 mmHg vs 90 mmHg), heart rate (59 vs 58.8 bpm) or pupil size (2 mm vs 2 mm) between those with the reflex and those without. The average bispectral index value was 32.75 (range, 22–50) in the blink group and 26.77 (range, 18–49) in the non-blink group. No patients moved on injection.

Discussion

The blink reflex appears to occur in a surprising 50 per cent of patients, despite a deep level of anaesthesia. The

anaesthetist's initial response might be to deepen the anaesthesia, but considering the already deep levels of anaesthesia shown by the low bispectral index values (average of 28) and low systolic blood pressure, this does not seem necessary. One should instead consider whether this is an abnormal nasociliary 'referred' blink reflex.

A normal blink reflex (as opposed to normal blinking), also known as a corneal reflex,¹ is an involuntary blinking of the eyelids usually elicited by stimulation of the cornea (such as by touching or by a foreign body). The reflex occurs at a rapid rate of 0.1 seconds, as with a spinal reflex, and there is no conscious involvement. The evolutionary purpose of this reflex is to protect the eyes from foreign bodies.

The normal blink reflex is mediated by: the nasociliary branch of the ophthalmic nerve (V₁) of the Vth cranial nerve (trigeminal nerve), upon sensing a stimulus on the cornea, lid or conjunctiva (the afferent); the VIIth cranial nerve (facial nerve), which initiates the motor response (the efferent); and the medullary centre, via the spinal trigeminal nucleus.

Nasal sensation² is also derived from the first two branches of the trigeminal nerve: the internal branch (ethmoid and frontal sinuses) and the external branch (nasal skin from rhinion to tip). In particular, the sensory innervation of the nose is via the ophthalmic division (V₁), and includes: the nasociliary nerve (the skin of the nose and mucous membrane of the anterior nasal cavity); and the anterior ethmoid nerve (the anterior half of the nasal cavity).

In this situation, as there is no motor component to the V₁ branch of the trigeminal nerve, the pain stimulus of the nasal mucosa (the nasociliary nerve component) is referred via the trigeminal nucleus to the medulla, 'perceived' as a corneal irritation and referred back via the facial nerve to initiate the blink – an abnormal 'nasociliary blink reflex'. Bernard and Péréon previously used the blink reflex for specific localisation of the infraorbital nerve for facial analgesia.³ They used the response to locate the nerve. The clinical relevance in our form of surgery is the knee-jerk reaction that the patient is not at an adequate depth of anaesthesia. This is not so.

- **Patients blink in response to local anaesthetic injection into the vestibular skin or anterior septum during septoplasty or septorhinoplasty, despite deep anaesthesia**
- **Barring any neurological conditions, this is likely to be due to a referred nasociliary reflex**
- **Deepening of anaesthesia is not required**

Blepharospasm is a form of focal dystonia characterised by involuntary movements in the upper face and may implicate the orbicularis oris muscles. This condition may be caused by increased activity in the thalamic region of the brain.⁴ In our patients, there

was no evidence of any form of dystonia, and the characteristics were more of a reflex rather than a primary neurological pathological condition.

In the face of no evidence to suggest neurological conditions, and the fact that the blinking occurs in direct response to a stimulus, we saw little reason to investigate this phenomenon further. Rather, it is now our practice, assuming an adequate depth of anaesthesia, to continue with the local anaesthetic injection should this blink reflex occur.

Conclusion

The sudden blinking that occurs on injection of local anaesthetic into the nasal mucosa may be disconcerting for the surgeon. However, assuming the patient has no obvious known neurological disease, and there is an adequate depth of anaesthesia and pain relief, we hypothesise that this is a referred nasociliary blink reflex. The solution is to complete the local anaesthetic injection. Once the nose is anaesthetised, the Doyle–Saleh blink reflex disappears.

Acknowledgement

The authors would like to acknowledge Mr C Sawicki for his help with statistical analysis.

References

- 1 Corneal reflex. In: http://en.wikipedia.org/wiki/Corneal_reflex [30 July 2014]
- 2 Nasal Anatomy. In: <http://emedicine.medscape.com/article/835134-overview> [30 July 2014]
- 3 Bernard JM, Péréon Y. Nerve stimulation for regional anaesthesia of the face: use of the blink reflex to confirm the localization of the trigeminal nerve. *Anesth Analg* 2005;**101**: 589–91
- 4 Murai H, Suzuki Y, Kiyosawa M, Wakakura M, Mochizuki M, Ishiwata K. Positive correlation between severity of blepharospasm and thalamic glucose metabolism. *Case Rep Ophthalmol* 2011;**2**:50–4

Address for correspondence:

Dr Patrick W Doyle,
Department of Anaesthesia,
Charing Cross Hospital,
Imperial College Healthcare NHS Trust,
Fulham Palace Road,
London W6 8RF, UK

Fax: +44 (0) 20 8846 7587

E-mail: drpatrickdoyle@gmail.com

Dr P W Doyle takes responsibility for the integrity of the content of the paper
Competing interests: None declared
