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Case Report

Anaesthetic dilemma of controlled hypotensive anaesthesia and systemic effects of topical adrenaline during functional endoscopic sinus surgery

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ABSTRACT

Functional endoscopic sinus surgery (FESS) frequently requires controlled hypotensive anaesthesia and topical adrenaline to minimize intraoperative bleeding and improve surgical visualization. However, the concurrent use of these techniques may result in significant haemodynamic instability due to systemic absorption of adrenaline. This case report highlights the haemodynamic challenges encountered during FESS for a 45-year-old male with bilateral nasal polyposis under general anaesthesia. Controlled hypotension was achieved using propofol infusion. Following the application of a large amount of adrenaline-soaked gauze at 1:1,000 concentrations by the surgeon bilaterally, which precipitated a haemodynamic crisis marked by profound hypotension (80/40 mmHg), rebound hypertension (180/110 mmHg), and tachycardia (150 bpm), with consequent deterioration of the surgical field leading to poor visibility. Prompt substitution with a diluted 1:10,000 preparations restored haemodynamic stability. The patient recovered uneventfully and remained symptom-free at one-year follow-up. The anaesthetic dilemma of combining controlled hypotensive anaesthesia with topical adrenaline during FESS remains a significant challenge. Topical adrenaline use may cause profound systemic cardiovascular effects; however, vigilant monitoring, prompt recognition of haemodynamic disturbances, and the use of lower adrenaline concentrations are essential to ensure patient safety.

Keywords: Functional endoscopic sinus surgery, Controlled hypotensive anaesthesia, Topical adrenaline, Haemodynamic instability, Nasal polyps

INTRODUCTION

Functional endoscopic sinus surgery (FESS) is a widely performed minimally invasive procedure for the management of chronic rhinosinusitis and other sinonasal diseases.[1,2] Despite advances in endoscopic techniques, intraoperative bleeding remains a major challenge because even minimal bleeding can obscure the narrow surgical field and increase the risk of complications involving the orbit or skull base.[1,3] Hence, anaesthetists often employ controlled hypotensive anaesthesia and topical vasoconstrictors such as adrenaline to improve surgical visibility and reduce blood loss.[4,5]

Controlled hypotensive anaesthesia during FESS aims to lower the mean arterial pressure by approximately 20%, thereby reducing mucosal bleeding, enhancing endoscopic visualization and reduce operative time.[1] However, this technique presents an anaesthetic dilemma because excessive hypotension may compromise cerebral, cardiac, and renal perfusion, particularly in elderly patients and those with cardiovascular comorbidities.[1,6] Saxena and Nekhendzy reported that while controlled hypotension and total intravenous anaesthesia may improve surgical conditions, they require meticulous haemodynamic monitoring to avoid perioperative morbidity.[3]

Topical and injected adrenaline-containing solutions are generally used by surgeons to achieve local vasoconstriction and haemostasis. Evidence suggests that topical application of adrenaline at a 1:2000 dilution achieves haemostatic effects comparable to submucosal infiltration at a 1:100,000 dilution, while significantly reducing systemic absorption and associated

cardiovascular side effects.[4,5] However, intranasal infiltration of adrenaline has been consistently associated with significant haemodynamic instability, including hypertension, tachycardia, and arrhythmias, attributable to systemic absorption through the richly vascularised nasal mucosa.[4] Zhao et al reported that even low-dose adrenaline infiltration induced a transient but marked decrease in blood pressure via beta-2 adrenoceptor-mediated vasodilatation, an effect that may be easily overlooked with non-invasive blood pressure monitoring.[8]

The simultaneous pursuit of controlled hypotension and the use of vasoactive topical agents create a complex and potentially dangerous anaesthetic dilemma, particularly in patients with pre-existing cardiovascular comorbidities. This case report highlights the anaesthetic dilemma encountered during controlled hypotensive anaesthesia for FESS and discusses the systemic haemodynamic consequences associated with topical adrenaline use.

CASE REPORT

A 45-year-old male presented to the otorhinolaryngology clinic with a complaint of progressive right nasal blockage of two years' duration. The symptoms were associated with frequent yellowish discharge, offensive nasal discharge, occasional headache, and snoring. He was scheduled for elective FESS. There was no other systemic illness. He was a non-smoker and denied alcohol consumption. Examination revealed a greyish mass hanging from the nasopharynx with yellowish discharge in both nasal cavities. Further endoscopic examination showed that the mass arose from the middle meatus and extended into the nasal cavity. Computed tomography (CT) of the paranasal sinuses reported a soft tissue mass in the nasal cavities, with near-complete opacification. Airway assessment showed Mallampati class II with adequate mouth opening and neck mobility. Full blood count and coagulation profile were normal. Chest X-ray, serum electrolytes, renal function tests, and electrocardiography did not detect any abnormalities. The patient's blood was grouped and cross-matched. The patient was classified as ASA physical status II.

Conduct of anaesthesia

After obtaining informed consent, the patient was transferred to the operating theatre and standard monitoring was instituted, including: pulse oximetry, non-invasive blood pressure monitoring, 5-lead electrocardiography, capnography, and temperature monitoring. Intravenous access was secured. Premedication consisted of intravenous (IV) glycopyrrolate 0.2 mg and IV midazolam 2 mg. Anaesthesia was induced using IV propofol 150 mg, and endotracheal intubation was facilitated with IV suxamethonium 150 mg. Anaesthesia was maintained with isoflurane in 100% oxygen, IV morphine 7 mg, IV acetaminophen 900 mg, IV pancuronium 6 mg, with additional aliquots of 2 mg PRN; the patient was mechanically ventilated. He was placed in reverse trendelenburg position to reduce venous congestion. Controlled hypotensive anaesthesia was achieved using propofol infusion titrated to effect. Surgeon inserted gauze soaked in 10 ml of 1: 1,000 adrenaline solution (into both nasal cavities) to control haemorrhage and provide a bloodless surgical field. There was intraoperative swing in blood pressure ranging between 80/40 to 180/110 mmHg, and the heart rate fluctuated between 58 and 150 bpm. The surgical field rapidly became bloodier despite previous adequate hypotension, impairing endoscopic visualization. The surgeon was immediately informed and the nasal packs were removed; subsequent adrenaline gauze nasal packs were prepared at a 1: 10,000 concentrations and applied after thorough squeezing. Oxygenation remained adequate throughout, with oxygen saturation maintained above 97%. Haemodynamic parameters gradually stabilized. Estimated blood loss was 250 ml. Surgery lasted approximately two hours. At the end of the procedure, residual neuromuscular blockade was antagonized and with signs of recovery, the patient was extubated and transferred to the post anaesthesia care unit for continuous monitoring. The patient was discharged home on postoperative day three. Histopathologic report of specimen revealed benign inflammatory nasal polyp. The patient experienced a recovery with resolution of complaints and no recurrence at one year postoperatively.

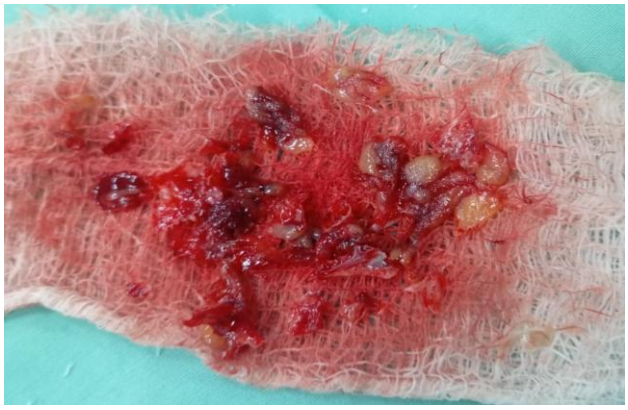

Figure 1: Excised nasal polyposis.

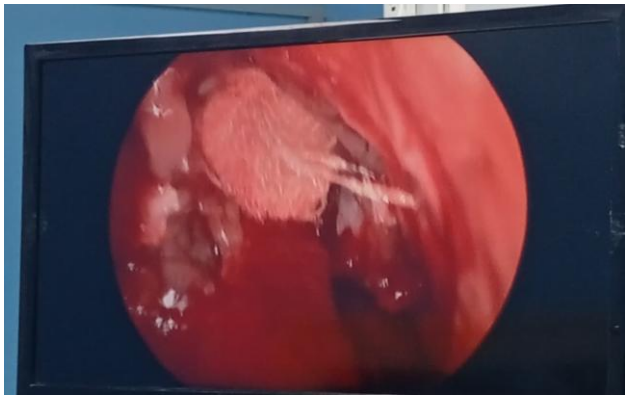

Figure 2: Nasal endoscopy with adrenalin-soaked gauze.

DISCUSSION

FESS requires optimal surgical visibility within a confined anatomical space. Consequently, controlled hypotensive anaesthesia and topical vasoconstrictors such as adrenaline are commonly used to reduce mucosal bleeding and improve the surgical field.[1,3] However, the combination of these techniques may create significant haemodynamic challenges, as demonstrated in this case.

The patient developed marked fluctuations in blood pressure and heart rate following the insertion of nasal packs soaked in a 1:1000 adrenaline solution. Blood pressure varied from 80/40 mmHg to 180/110 mmHg, while heart rate ranged between 58 and 150 beats per minute. These haemodynamic changes occurred despite the patient having no significant cardiovascular disease and being under controlled hypotensive anaesthesia. The temporal relationship between adrenaline application and haemodynamic instability strongly suggests systemic absorption of adrenaline through the highly vascularized nasal mucosa.

Several studies have documented the cardiovascular effects of adrenaline during FESS. Rasheed et al reported that adrenaline administration can produce significant haemodynamic responses, particularly when higher concentrations or larger doses are used.[4] Similarly, Moshaver et al demonstrated that systemic absorption of adrenaline during sinonasal surgery may result in hypertension, tachycardia, and cardiac rhythm disturbances.[5] In the present case, the use of 10 ml of 1:1000 adrenaline-soaked gauze likely resulted in substantial systemic absorption, producing both alpha- and beta-adrenergic stimulation and contributing to the observed cardiovascular instability.

An interesting observation in this case was the occurrence of profound hypotension despite adrenaline administration. This finding is consistent with the report by Zhao et al, who described transient marked hypotension following low-dose adrenaline administration during FESS.[8] The proposed mechanism involves predominant stimulation of beta-2 adrenergic receptors, resulting in peripheral vasodilatation and a sudden decrease in systemic vascular resistance. Additionally, Intravenous propofol was used to augment the effect of the inhalational agent Isoflurane to achieve a better hypotensive anaesthesia rather than the use of isoflurane alone. Such hypotensive episodes may be particularly hazardous in patients who have a compromised cardiovascular status when subjected to controlled hypotension, potentially compromising cerebral, myocardial, and renal perfusion.[5]

This case also highlights the anaesthetic dilemma associated with balancing surgical requirements and patient safety. Controlled hypotension improves endoscopic visibility, reduces blood loss, and reduction of surgery duration; however, when combined with vasoactive agents capable of unpredictable systemic effects, the risk of significant haemodynamic instability increases. Tan and Poopalalingam and Saxena and Nekhendzy emphasized the importance of meticulous haemodynamic monitoring during FESS, especially when hypotensive techniques and adrenaline are used concurrently. [1,3]

Following recognition of the haemodynamic instability, the surgical team replaced the 1:1000 adrenaline pack with a more dilute 1:10,000 preparation that was carefully squeezed before application. This intervention resulted in the gradual stabilization of blood pressure and heart rate while allowing surgery to continue successfully. This observation supports the findings of Sarmento Junior et al, who demonstrated that lower concentrations of topical adrenaline can provide adequate haemostasis while minimizing systemic cardiovascular effects.[7]

This case underscores the importance of close communication between the surgeon and anaesthetist during FESS. Early recognition of abnormal haemodynamic responses, prompt removal of adrenaline-soaked packs, and adjustment of vasoconstrictor concentration are essential to prevent serious complications. Consideration should also be given to the use of lower concentrations of topical adrenaline and invasive arterial blood pressure monitoring in selected patients in whom significant haemodynamic fluctuations are anticipated.[3,6,9]

CONCLUSION

Anaesthetists should remain vigilant, as even topical adrenaline may produce profound systemic cardiovascular effects, and should be prepared to recognise and manage these complications promptly. Vigilant monitoring, effective communication between the surgical and anaesthetic teams, and the use of lower concentrations of topical adrenaline are essential to ensure patient safety.

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