Case Report

Controlled Hypotension in Endoscopic Sinus Surgery with Dexmedetomidine as Adjunct: A Report of Two Cases

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Abstract

The success of endoscopic surgery in otolaryngology largely depends on the surgical field, where the presence of significant bleeding is a critical factor. Bleeding obscures surgical planes and the recognition of anatomical landmarks becomes quite difficult. Various manoeuvers and drugs have been used for optimization of the surgical field. Conventionally, beta blockers and sodium nitroprusside have been used to control the intraoperative blood pressure. Newer agents such as remifentanil and adrenergic alpha-2 agonists such as clonidine and dexmedetomidine are also being tried. We report two cases of endoscopic sinus surgery (ESS) where dexmedetomidine infusion as adjunct to propofol infusion and inhalational anesthesia with sevoflurane [minimum alveolar concentration (MAC) 0.5-0.8] were utilized for providing an optimal surgical field.

Key words: Adrenergic alpha-2 receptor agonist, controlled hypotension, minimally invasive surgical procedures, otolaryngology

Introduction

The success of endoscopic surgery in otolaryngology largely depends on the surgical field, where the presence of significant bleeding is a critical factor.[1,2] Bleeding obscures surgical planes and the recognition of anatomical landmarks becomes quite difficult.[2-4] Chronic infection and significant inflammation of sinuses can also lead to increased vascularity. The risk of complications, such as intraoperative trauma to the anterior skull base and nasolacrimal, orbital, or internal carotid arteries as well as postoperative scarring, increases when surgical manipulation is attempted in a field that is not optimized.[1] Controlled hypotension to limit blood loss and improve surgical visibility has a major role in optimizing the surgical field. We report two cases of endoscopic sinus surgery (ESS) where dexmedetomidine infusion as adjunct to propofol infusion and inhalational anesthesia with sevoflurane [minimum alveolar concentration (MAC) 0.5-0.8] were utilized for providing an optimal surgical field.

Case Reports

Case 1

A 64-year-old lady, a case of chronic dacryocystitis (right) and deviated nasal septum (right) was posted for endoscopic dacryocystorhinostomy (right) and ESS. Preanesthetic assessment revealed difficult airway. The patient was considered American Society of Anesthesiologists (ASA) grade 1 with difficult airway. She was taken up for surgery under general anesthesia with controlled hypotension intraoperatively.

Dexmedetomidine infusion was started intravenously (IV) at 1 mcg/kg/h bolus for 10 min, then continued as 0.5 mcg/kg/h for maintenance for the entire period of surgery. Awake fiberoptic bronchoscope (FOB)-assisted endotracheal intubation was performed and then induced with propofol and vecuronium. Propofol IV infusion was commenced at 50-75 mcg/kg/min for maintaining controlled hypotension. The inhalational agent O_2/air/sevoflurane (MAC 0.5-0.6) was instituted. Analgesia was provided with fentanyl 100 mcg and morphine 4.5 mg.

Heart rate (HR) of 58-68/min, mean arterial pressure (MAP) of 65-77 mmHg, and end-tidal carbon dioxide ($etCO_2$) of 32-35 mmHg were maintained intraoperatively with well-controlled oxygenation and hemodynamics. Blood loss of 500 mL was noted. Surgery time was 5 h. The patient recovered completely, and smooth extubation was performed. The time taken from the end of dexmedetomidine infusion to extubation was 18 min. The postoperative period was uneventful.

Case 2

A 37-year-old male patient, a case of extensive sinonasal polyposis and allergic fungal rhinosinusitis was posted for ESS and septoplasty. He was considered ASA grade 2.

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The patient was premedicated with fentanyl 100 mcg IV. Dexmedetomidine infusion IV at 1 mcg/kg/h was started for 10 min before induction as bolus after baseline monitoring, which was later continued at 0.5 mcg/kg/h for the entire intraoperative period.

Propofol IV infusion at 50-75 mcg/kg/min was commenced post induction and for maintaining controlled hypotension. The inhalational agent O_2/air/sevoflurane (MAC 0.5-0.6) was instituted to prevent awareness. Analgesia was provided with fentanyl 100 mcg and morphine 4.5 mg. HR of 60-66/min, MAP of 64-75 mmHg, and $etCO_2$ of 32-36 mm Hg were maintained intraoperatively with well-controlled oxygenation and hemodynamics. Blood loss of 800 mL was noted. Surgery time was 5 h 15 min. The patient recovered completely, and smooth extubation was performed. The time taken from the end of dexmedetomidine infusion to extubation was 15 min. The postoperative period was uneventful.

Discussion

Potential success or failure in ESS depends on the optimal surgical field, which, in turn, depends on the bleeding occurring intraoperatively.

Various manoeuvers and drugs have been used for optimization of the surgical field. These include the following: Positioning of the patient with raised head-end so as to facilitate venous return from the head and neck; administration of preoperative antibiotics and steroids for decreasing inflammation and infection; local infiltration of 2% solution of lignocaine with 1:80,000 adrenaline; and topical vasoconstriction with 0.1% oxymetazoline and 1:100,000 adrenaline.

Conventionally, beta blockers and sodium nitroprusside have been used to control the intraoperative blood pressure. Newer agents such as remifentanil and the adrenergic alpha-2 agonists clonidine and dexmedetomidine are also being tried.[5] Surgical fields are better when total intravenous anesthesia (TIVA) was administered, in contrast to inhalational agents,[6] as the later leads to vasodilatation and increased bleeding into the field.

Alpha-2 adrenoceptor agonists (clonidine and dexmedetomidine) cause a modest reduction in blood pressure and HR though a centrally mediated action. They produce a dose-dependent sedation, anxiolysis, and analgesia without respiratory depression. In addition, they have reduced anesthetic requirements and afford hemodynamic stability. Dexmedetomidine is a highly receptor-specific agent and has a favorable kinetics, with a distribution half-life of 6 min and an elimination half-life of 2 h.

Adverse effects of alpha-2 agonists are hypotension and bradycardia, primarily seen in younger patients with high levels of vagal tone,[7] and in patients having hypovolemia, chronic hypertension or diabetes mellitus. Caution is to be exercised when administering dexmedetomidine to patients of heart blocks, patients with severe ventricular dysfunction, and those on beta blockers. The use of dexmedetomidine in patients below 18 years is not recommended due to lack of clinical evidence supporting its safety.

Dexmedetomidine, owing to its favorable kinetics, has become a potentially attractive drug for neuroanesthesia and intensive care unit (ICU) sedation, but there are studies where it has been utilized in ESS in comparison with drugs such as esmolol[8] and remifentanil,[9] and has proved its worth.

By utilizing dexmedetomidine as adjunct in our anesthesia plan, we could provide controlled hypotension and an optimal HR of 60-66/min, translating to an optimal surgical field (Boezaart and van der Merwe grade 2)[3] [Table 1] with adequate renal, coronary, and cerebral perfusion. Blood loss in both the cases was less than 300 mL and no blood products were required perioperatively. This also led to a decrease in the amount of propofol and inhalational anesthetics required intraoperatively to maintain a lower blood pressure. The MAC maintained was 0.5-0.8, which is much less than the MAC required when inhalational agents are solely utilized for hypotensive anesthesia. The dosage of propofol utilized was also in the range of sedating doses (100-50 mcg/kg/min), which was much less than the dosage required if propofol was used for total intravenous anesthesia. Thus, dexmedetomidine used in conjunction decreased the anesthetic requirement considerably and also maintained controlled hypotension with stable hemodynamics. A smooth, controlled emergence and extubation was also achieved in both the cases.

To conclude, future investigations and randomized controlled trials will, it is expected, second the use of this drug for specific endonasal procedures requiring a clear operative field and controlled hypotension in appropriately selected patient populations.

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Table 1: Boezaart and van der Merwe grading system for bleeding during ESS

Grades	Surgical field
Grade 1	Cadaveric suction with minimal suction required
Grade 2	Minimal bleeding with infrequent suction required
Grade 3	Brisk bleeding with frequent suction required
Grade 4	Bleeding covers surgical field after removal of suction before surgical instrument can perform maneuver
Grade 5	Uncontrolled bleeding; bleeding out of nostril on removal of suction

ESS: Endoscopic sinus surgery

Source: Boezaart AP, van der Merwe J, Coetzee AR. Comparison of Sodium nitroprusside and esmolol induced controlled hypotension for functional endoscopic sinus surgery. Can J Anaesth 1995;42 (5 Pt 1): 373-376

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