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# Effect of Dexmedetomidine on Incidence of Emergence Delirium in Adult Nasal Surgery

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## Abstract

Emergence delirium (ED) is an acute phenomenon that develops in the early phase of recovery from general anesthesia, and characterized by confusion, disorientation, and possible violent behavior, and is a common occurrence particularly with nasal surgery. Dexmedetomidine is a highly selective alpha-2 adrenergic agonist that results in anxiolysis, sedation, analgesia, and sympatholysis without depressing ventilation. 392 participants across five studies revealed a lower incidence of ED in dexmedetomidine groups than control groups (21% vs 50%). Mean arterial pressure (MAP) and heart rate (HR) among dexmedetomidine groups exhibited less variability during emergence without hypotension, which indicates a more stable hemodynamic profile. Analgesic and antiemetic requirements in the post-anesthesia care unit (PACU) were decreased in dexmedetomidine groups, however these results were not statistically significant. Intraoperative dexmedetomidine significantly decreases the incidence of ED. Secondary effects, like hemodynamic stability and analgesia, were observed, but these qualities need to be further studied before they can be generalized.

**About the Author:** Christopher Steinkampf is a registered intensive care unit nurse, currently enrolled in Texas Christian University Nurse Anesthesia program.

# Effect of Dexmedetomidine on Incidence of Emergence Delirium in Adult Nasal Surgery

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## Introduction

- Emergence delirium (ED) an acute phenomenon that develops in the early phase of recovery from anesthesia, and characterized by confusion, disorientation, & possible violent behavior
- May lead to serious complications: self-extubation, aspiration, hypoxia, increased pain, or bleeding
- Risk factors: male gender, younger age, patient personality, preoperative anxiety, rapid awakening, postoperative pain, type of surgical procedures, inhalational anesthetics, and presence of tracheal tube[2-6]
- Higher incidence with nasal surgery due to postoperative nasal packing that can simulate the feeling of suffocation[2]
- Dexmedetomidine – alpha-2 adrenergic agonist that binds at presynaptic and postsynaptic site (Figure 3), which causes decrease in norepinephrine levels[1]
- Dexmedetomidine produces sedative, analgesic, and sympatholytic effects without respiratory depression[1]
- PICOT: In adult patients undergoing nasal surgery, does intraoperative dexmedetomidine compared to a placebo decrease the incidence of ED, as assessed by the Riker Sedation-Agitation Scale (Table 1), immediately after extubation?

## Case Summary

**Pre-Anesthetic Evaluation**

- 19-year-old, 98 kg, 180 cm, male presented for septoplasty
- Medical history: no significant past medical history
- Pre-op medications: acetaminophen 650 mg, gabapentin 300 mg
- Vital signs: HR 72, BP 131/77 (95) mmHg, $SpO_2$ 98%, RR 18

**Intraoperative Course**

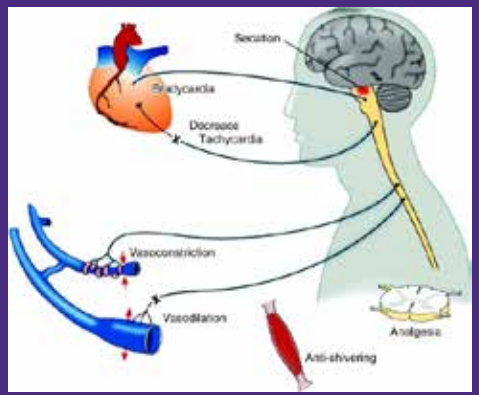
- Induction: lidocaine 100 mg, propofol 300 mg, rocuronium 30 mg
- ETT 8.0 via direct laryngoscopy
- Maintenance: sevoflurane 1.2-1.6% end-tidal concentration, 1 L/min oxygen, 1 L/min medical air
- Emergence: sevoflurane 0%, neostigmine 3 mg IV, glycopyrrolate 0.6 mg IV, fentanyl 50 mcg, ondansetron 4 mg IV, ketorolac 30 mg IV

**Postoperative Course**

- Extubated under positive pressure, 10 L/min of oxygen of fresh gas flow, became dangerously agitated, non-cooperative, thrashed his arms and legs and became hypoxic
- Vital signs: HR 114, BP 151/99 (116) mmHg, $SpO_2$ 77%, RR 33
- Staff restrained him and attempted to verbally reminded him he was in the OR
- Sedated with propofol 50 mg IV and lidocaine 50 mg IV to facilitate bag-mask ventilation and correct the hypoxia

## Evidence Search Strategy

- Databases: PubMed and EMBASE
- Keywords: anesthesia, dexmedetomidine, emergence, nasal surgery
- Further limits: publication date 2011 to 2021, "English only", and "human only"
- 29 studies were identified
- Evidence was refined by focusing on RCT, systematic reviews, and meta-analyses
- Five RCTs were chosen based on their research procedures and primary outcomes




| | Group D (n=50) | Group C (n=50) | P-value |
|---|---|---|---|
| Time to verbal response (min) | 8.1 (2.9) | 7.0 (2.5) | 0.044 |
| Time to extubation (min) | 8.7 (2.9) | 7.8 (2.6) | 0.092 |
| Respiratory rate at extubation ($min^{-1}$) | 17.0 (4.5) | 17.5 (4.4) | 0.633 |
| BIS at extubation | 81.5 (5.7) | 83.2 (5.6) | 0.145 |
| Grade of cough during emergence | 2 (0–3) | 2 (0–3) | 0.469 |
| Residual sedation in PACU | 2 (4%) | 0 | 0.495 |
| NRS for pain in PACU | 2 (0–6) | 2 (0–8) | 0.061 |
| Analgesics in PACU | 4 (8%) | 8 (16%) | 0.218 |
| Antiemetics in PACU | 3 (6%) | 9 (18%) | 0.065 |
| Length of PACU stay (min) | 16.2 (5.3) | 16.4 (5.5) | 0.897 |

**Table 1** Riker Sedation–Agitation Scale

| Score | Term | Descriptor |
|---|---|---|
| 1 | Unarousable | Minimal or no response to noxious stimuli, does not communicate or follow commands |
| 2 | Very sedated | Arouse to physical stimuli but does not communicate or follow commands, may move spontaneously |
| 3 | Sedated | Difficult to arouse but awakens to verbal stimuli or gentle shaking, follows simple commands but drifts off again |
| 4 | Calm and cooperative | Calm and follows commands |
| 5 | Agitated | Anxious or physically agitated and calms to verbal instructions |
| 6 | Very agitated | Requiring restraint and frequent verbal reminding of limits, biting endotracheal tubes |
| 7 | Dangerous agitation | Pulling at tracheal tube, trying to remove catheters or striking at staff |

Figure 1. Adapted from Kim et al[4]

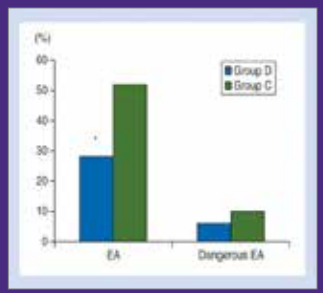



Table 2. Adapted from Kim et al[4]

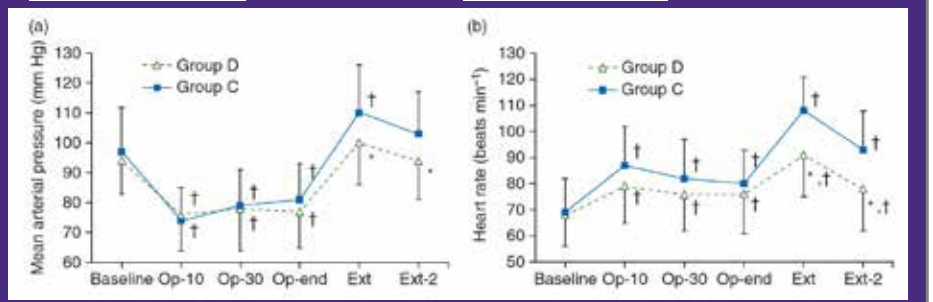



Figure 2. Adapted from Kim et al[4]

## Review of literature

- Five RCTs assessed how intraoperative dexmedetomidine effected the recovery profile on adults after general anesthesia; primary measurement – ED
- Total of 396 ASA I or II patients aged between 18 to 65 years scheduled for elective nasal surgery; 196 in dexmedetomidine group (group D), 196 in control group (group C)
- Each RCT reported a significant decrease in the incidence of ED in the dexmedetomidine groups
- Collectively, of the 196 group D patients, 42 (21%) experienced ED and of the 196 group C patients, 98 (50%)[2-6] ($P < 0.05$)
- The sympatholytic and analgesic properties of dexmedetomidine provided a more stable hemodynamic profile during emergence and decreased analgesic requirements, which may have also decreased antiemetic requirements
- Heart rate and mean arterial pressure were consistently more stable during emergence in group D compared to group C[2-6]
- Analgesic and antiemetic requirements in the PACU were decreased in group D compared to group C[2-6]
- Dexmedetomidine's effect on PACU length of stay was inconsistent across these studies, but there was not a clinically significant difference between group D and group C[2-6]
- Gaps in knowledge: long-term effects of dexmedetomidine beyond PACU and 24h, bolus vs. infusion vs. combination, applicability to ASA > II, applicability to other surgeries

## Conclusions

- Intraoperative dexmedetomidine is a safe and effective anesthetic adjunct that significantly decreases the incidence of ED compared to receiving a placebo
- Loading dose of dexmedetomidine 1 mcg/kg bolus followed by maintenance infusion 0.4 mcg/kg/h after induction provided the greatest attenuation of ED.
- Secondary positive effects, such as hemodynamic stability, analgesia, and decreased antiemetic requirements, were observed, but these qualities need to be further studied with an appropriate sample population
- Overall, dexmedetomidine facilitated a smoother emergence from general anesthesia without any complications
- Since there are no absolute contraindications to dexmedetomidine, further research should explore how patients classified as > ASA II may benefit from this anesthetic technique
- Future studies should compare the effects of intraoperative dexmedetomidine at different dosages to standardize the anesthesia regimen
- Although ED is typically seen immediately after extubation, further research is needed to determine long-term outcomes of dexmedetomidine

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