



# The Choice of Anesthetic Agents for Endoscopic Sinus Surgery: Can Sinus Surgeons Be Involved?

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Since the first article on sinus surgery and anesthetics was published in the 1970s, the number of articles published on this topic has increased rapidly. In the 2010s, growing evidence has shown that total intravenous anesthesia (TIVA) helps secure intraoperative bleeding and endoscopic vision more effectively than inhalation anesthesia (INA), and results have continued to be reported after the publication of a landmark meta-analysis in 2013 [1]. Dexmedetomidine and remifentanyl are among the most popular additional drugs used in TIVA, along with propofol. Dexmedetomidine is a highly selective  $\alpha_2$ -adrenergic receptor agonist that produces dose-dependent sedation, anxiolysis, and analgesia without respiratory depression [2]. However, dexmedetomidine is known to cause or worsen hypotension or bradycardia [3]. Therefore, when used for general anesthesia (GA), careful monitoring by an anesthesiologist is required. Dexmedetomidine is indicated for sedation in the intensive care unit (intubated and mechanically ventilated patients) and procedural sedation (non-intubated patients) in adults. Although many reports have described the use of dexmedetomidine in GA, its use for GA remains off-label. Thus, the use of dexmedetomidine in GA is not reimbursed by insurance in various countries, including South Korea. Remifentanyl is a specific short-acting  $\mu$ -type opioid receptor agonist that provides hypotension with intraoperative hemodynamic stability [4]. It has a rapid onset and rapid recovery time and reduces sympathetic nervous system tone. It also can produce a dose-dependent analgesic effect and a 15% to 20% decrease in arterial blood pressure.

Controlled hypotension is defined as lowering the systolic blood pressure to 80–90 mmHg, the mean arterial pressure (MAP) to 50–65 mmHg, or a 30% reduction of the baseline MAP [5]. Inhaled anesthetics, such as sevoflurane, act on the smooth muscle of blood vessels to induce controlled hypotension, which causes vasodilation of peripheral and cerebral blood vessels to increase blood flow to the paranasal sinuses. In contrast, since TIVA in-

duces hypotension by reducing central sympathetic tone, vasodilation of peripheral blood vessels does not occur, which is an advantage of TIVA in endoscopic sinus surgery (ESS) [6]. A double-blind, randomized controlled trial in patients with severe chronic rhinosinusitis with nasal polyposis who had a preoperative Lund-Mackay score of 12 or higher showed a favorable surgical field and less blood loss in TIVA [7]. The meta-analysis that analyzed the results of multiple trials on TIVA and ESS also concluded that TIVA tends to provide better surgical vision and less bleeding than INA.

Another concern of anesthesiologists and sinus surgeons is the patient's agitation in the post-anesthesia care unit immediately after surgery. Surgical site pain and nasal obstruction due to nasal packing may cause agitation, which temporarily raises blood pressure and may cause rebleeding at the surgical site. A meta-analysis of postoperative recovery after TIVA with dexmedetomidine reported that postoperative pain and agitation were reduced compared to INA or remifentanyl administration [8,9].

As mentioned above, TIVA has several intraoperative and postoperative advantages over INA in ESS. However, TIVA also has the following disadvantages and risks: (1) a slightly increased risk of awareness; (2) hemodynamic instability with propofol, especially in the setting of severe blood loss; (3) no ability to monitor drug concentration in real time; and (4) more challenging titration in patients with opioid or benzodiazepine tolerance [10]. Therefore, to take advantage of TIVA and minimize its side effects, TIVA should be performed by a well-trained anesthesiologist, and careful monitoring of the patient during anesthesia should be performed. Although extensive research has been done on TIVA, there are still many cases where TIVA is not selected as an anesthetic method when performing ESS. In a survey on anesthetic maintenance techniques published in 2020, 65% of anesthesiologists in the United States reported a lack of familiarity with the current evidence on TIVA for ESS [11]. This situation is

expected to be broadly similar in many other countries, including South Korea. Therefore, sinus surgeons need to keep learning evidence-based information on anesthetics for ESS. Furthermore, through active collaboration with anesthesiologists, it is desirable to improve clinical practice by conducting well-designed clinical trials to obtain higher-level evidence for TIVA and sinus surgery.

### CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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