Advancements in Office-Based Anesthesia in Oral and Maxillofacial Surgery

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KEYWORDS

• Infusion • Pump • LMA • Laryngeal • Mask • Airway • Capnography

KEY POINTS

- An infusion pump enables delivery of a smooth anesthetic consisting of propofol or propofol combined with other rapid-onset/offset agents such as ketamine and remifentanil.
- Maintenance intravenous therapy during anesthesia for oral and maxillofacial surgery (OMS) should consist of an isotonic crystalloid solution such as normal saline or lactated Ringer 15 mL/Kg and intravenous access with an angiocatheter as opposed to a metal needle.
- For patients at risk for postoperative nausea and vomiting, a multimodal approach should be used with agents that are antagonists at 5-HT_3, dopamine 2, and muscarinic receptors augmented by dexamethasone and propofol as an anesthetic.
- Obese patients with obstructive sleep apnea and gastroesophageal reflux disease represent an airway risk for which airway adjuncts such as a laryngeal mask airway, nasopharyngeal catheter, or tongue suture should be considered.
- Capnography and pretracheal auscultation with a Bluetooth pretracheal stethoscope provide essential monitoring of ventilation during office-based anesthesia.

Introduction

It is fitting that the first decade of a new millennium would witness significant advancements in office-based anesthesia in oral and maxillofacial surgery (OMS). These advancements are numerous and far reaching, and include the agents most commonly used and their method of delivery, as well as perioperative management and monitoring. In this article, some of the more significant of these advancements that have taken place during the last decade are explored. A useful tool in monitoring the changes has been the benchmark studies conducted by the American Association of Oral and Maxillofacial Surgeons (AAOMS). The first of these studies was fielded at the beginning of the last decade and the current one at the beginning of the second, in 2011 to 2012. The first study[1] relied on volunteers and took place over several years, with a cohort of nearly 25,000 patients. Participants in the second study were chosen by a random sampling. The preliminary data from this latter study are just becoming available and currently consist of a cohort of approximately 2600 patients. Because the data from the current registry are preliminary and there are differences in study design, only general comparisons can be made to monitor trends (Table 1).

Comparison of the data from the 2 AAOMS studies (see Table 1) shows that third molar removal continues to be the most frequently performed procedure (approximately 70%). On the other hand, over the decade, other dentoalveolar procedures have decreased by more than 50% ($P<.001$), whereas implant procedures have increased 50% ($P<.001$). The operating surgeon continues to be the primary manager of anesthesia, and nearly 90% of the procedures performed are less than an hour in length. However, the 2011 to 2012 study suggests that there is an increase of more than 30% in procedures greater than 30 minutes in length ($P<.001$), which may in part be a reflection of the increase in implant procedures.

Agents

Primary Intravenous Anesthetic Agents

The modern era of office-based anesthesia in our specialty began in the 1950s, when Hubbell and Krogh popularized the use of intravenous (IV) Pentothal (thiopental) anesthesia. Pentothal was replaced by the shorter-acting barbiturate methohexital, which continued to be the primary agent used for office-based anesthesia until the end of the century. However, when problems developed at the production facility for methohexital in the early years of the twenty-first century, many surgeons were forced to turn to propofol, which had largely replaced the barbiturates in medical anesthesia during the previous decade. Although methohexital returned to the marketplace, many of those oral and maxillofacial surgeons

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Table 1 The patients, providers, and perioperative management of the AAOMS benchmark studies

	Data from 2000[a]	Data from 2011–2012[b]	% Change	*P* Value
Number of Patients	24,737	2577		
Procedure Performed				
Third molar	16,892 (68.3%)	1834 (71.2%)	↑ 4.2%	<.003
Other dentoalveolar	17,652 (30.9%)	566 (22.0%)	↓ 53.1%	<.0001
Implant	650 (2.6%)	101 (3.9%)	↑ 50.0%	<.0001
Primary Manager of Anesthesia				
Operating surgeon	23,576 (95.5%)	2410 (93.5%)	↓ 2.1%	<.0001
Certified registered nurse anesthetist	654 (2.6%)	88 (3.4%)	↑ 30.8%	<.03
Anesthesia Time (min)				
10–30	14,622 (59.1%)	1216 (47.2%)	↓ 20.1%	<.0001
31–60	7588 (30.7%)	1042 (40.4%)	↑ 31.6%	<.0001
IV Access Device				
Straight needle or butterfly	12,218 (49.4%)	430 (16.6%)	↓ 66.4%	<.0001
Angiocatheter	12,313 (49.8%)	2124 (82.4%)	↑ 65.5%	<.0001
IV Fluids				
None used	9208 (37.2)	0	↓ 100%	<.0001
IV fluids used	15,529 (62.8)	2555 (99.2)	↑ 50.0%	<.000

[a] Published in *J Oral Maxillofac Surg* 2003;61(9):988.
[b] Unpublished preliminary data.
Courtesy of Martin L. Gonzalez, MS, Senior Research Associate, American Association of Oral and Maxillofacial Surgeons, Rosemont, IL.

who had begun using propofol no longer wished to return to methohexital. Data from the AAOMS benchmarking studies (Table 2) indicate that most (approximately 70%; $P<.002$) patients receive propofol as their primary anesthetic agent. However, at the time of the first study a decade ago, a virtually identical large majority (approximately 70%; $P<.001$) were receiving methohexital and only approximately 20% were receiving propofol.

Two of the primary characteristics that have made propofol so popular with anesthesiologists and oral and maxillofacial surgeons are its rapid onset and offset.[2] The rapid onset is largely caused by its chemical structure (Fig. 1). First, the molecule is small, which allows easy passage through the blood-brain barrier (Fig. 2). The second characteristic is its high lipoid solubility and its resistance to its ionization. As a so-called hindered phenol, the hydroxyl radical of propofol at carbon 1 is protected from ionization by the bulky isopropyl groups at carbons 2 and 6 (see Fig. 1). The offset of propofol is caused by both rapid redistribution and rapid metabolism. Historically, the parameter of elimination half-life ($T_{½\beta}$) has not adequately accounted for both the rapid redistribution and biotransformation, which are in turn responsible for the rapid dissipation of the effects of such drugs as propofol. Consequently, a new parameter, the context-sensitive half-time, was developed and is described later.

Because its chemical structure provides propofol with rapid access to its receptor sites in the central nervous system (CNS), it can quickly bind to them and have a commensurate rapid onset. However, the bond is short-lived, and soon the propofol molecules return to the central circulation and pass to other

Table 2 The anesthetic agents and ancillary drugs received by patients in the AAOMS benchmark studies

	Data from 2000[a]	Data from 2011–2012[b]	% Change	*P* Value
Primary Parental Drug Used				
Ketamine HCl	5284 (21.4%)	1187 (46.1%)	↑ 115.4%	<.0001
Methohexital	17,086 (69.1%)	285 (11.1%)	↓ 83.9%	<.0001
Propofol	4768 (19.3%)	1774 (68.8%)	↑ 256.5%	<.0001
Opioids Used				
Fentanyl	16,142 (65.3%)	1884 (73.1%)	↑ 11.9%	<.0001
Meperidine	3745 (15.1%)	77 (3.0%)	↓ 80.1%	<.0001
Remifentanil	0	156 (6.1%)		<.0001
Benzodiazepines Used				
Diazepam	5288 (21.4%)	62 (2.4%)	↓ 88.8%	<.0001
Midazolam	16,456 (66.5%)	2446 (94.9%)	↑ 42.7%	<.0001
Other Medications Used				
Dexamethasone	14,002 (56.6%)	1679 (65.2%)	↑ 15.2%	<.0001
Glycopyrrolate	5829 (23.6%)	720 (27.9%)	↑ 18.2%	<.0001

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