Morbidity and Mortality With Outpatient Anesthesia: The Experience of a Residency Training Program

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Purpose: Previous studies regarding anesthetic-related morbidity and mortality rates in the oral surgery office have usually taken the form of a survey. This retrospective investigation of outpatient anesthetic morbidity and mortality was undertaken to compare the safety record of an oral and maxillofacial surgery training program with that of private practitioners.

Materials and Methods: Records from all outpatient general anesthesia cases performed in the Department of Oral and Maxillofacial Surgery at the Boston University Goldman School of Graduate Dentistry between August 13, 1990, and September 30, 1994, were reviewed for the incidence of nineteen separate categories of morbidity.

Results: There were 1,126 general anesthetics performed. There were 26 recorded incidents of morbidity (2.3%), none of which resulted in any postoperative sequelae. There were no deaths. The most common complication encountered was laryngospasm, with nine recorded incidents (0.8%). The second most common complication was cardiac dysrhythmia with eight recorded incidents (0.8%).

Conclusions: The low incidence of anesthetic-related morbidity seen in this study can most likely be attributed to proper patient selection. A carefully reviewed medical history and physical examination are the two most useful methods to prevent anesthetic emergencies. Another factor considered when selecting the proper anesthetic method includes the length and difficulty of the surgical procedure, with outpatient general anesthesia being reserved for those procedures that are predicted to be relatively short (30 to 45 minutes), and with little potential for airway difficulties.

The excellent safety record of general anesthesia in oral surgery is exemplified by numerous studies that clearly show a mortality rate for outpatient oral surgery anesthetic cases that is much lower than that seen with inpatient hospital anesthetic cases. However, this information must be evaluated in light of the fact that dental outpatients are generally healthy, and experience surgical and anesthetic events that are much briefer and less complicated than those that are performed in the hospital setting.

Previous studies regarding anesthetic-related morbidity and mortality rates in the oral surgery office usually have taken the form of a survey. D'Eramo* recently surveyed the Massachusetts Society of Oral and Maxillofacial Surgeons and found that the 147 active members reported a five-year mortality rate of 1 in 1,000,000. In addition, a general anesthetic morbidity rate of 0.5% was reported for the 19 separate categories of morbid events about which the members were asked to report. In a similar survey, Lytle and Stamper† reported on the 5 year morbidity and mortality statistics of the Southern California Society of Oral and Maxillofacial Surgeons in 1988. They found a mortality rate of 1 in every 633,000 anesthetics given, and a morbidity rate of 0.002% for all anesthetics given (local, sedation, and general anesthesia).

Our retrospective investigation of outpatient anesthetic morbidity and mortality was undertaken to com-
pare the safety record of an oral and maxillofacial surgery training program with that of private practitioners.

Patients and Methods

Records from all outpatient general anesthesia cases performed in the Department of Oral and Maxillofacial Surgery at the Boston University Goldman School of Graduate Dentistry between August 13, 1990 and September 30, 1994 were reviewed for the incidence of 19 separate categories of morbidity. The morbidity with conscious sedation and deep sedation cases was not reviewed.

The following definition of general anesthesia, adopted from the Massachusetts Board of Registration in Dentistry, was used: “General anesthesia is a controlled state of unconsciousness, accompanied by a partial or complete loss of protective reflexes, which may include inability to maintain an airway independently and to respond purposefully to physical stimulation or verbal command.”

All patients receiving general anesthesia were evaluated preoperatively by a third- or fourth-year oral surgery resident and judged to be in ASA category I or II. This evaluation included a review of the medical history, and a brief physical examination, with emphasis placed on evaluation of the patient’s airway, and cardiac, and respiratory systems.

All anesthetic cases were managed using a balanced technique of intravenous agents administered through an indwelling catheter. Most patients were first sedated with fentanyl (approximately 50 μg) and diazepam (approximately 10 mg), and then induced with methohexital (approximately 0.8 mg/kg), after initially receiving a test dose of approximately 20 mg methohexitol to assess possible allergic reactions or hypersensitivity. Thereafter, incremental doses of methohexital (approximately 20-mg boluses) were given as needed to maintain a sufficient level of unconsciousness.

All patients received local anesthesia with 2% lidocaine and 1:100,000 epinephrine immediately after the induction of general anesthesia. Most surgical cases were the removal of four bony impacted third molars, with an average anesthesia time of approximately 30 to 45 minutes. All patients had nothing to eat or drink for more than 6 hours before surgery, and they all reviewed and signed separate surgical and anesthetic informed consent forms.

Surgery was performed with the patients sitting in an upright position. All patients were breathing spontaneously throughout the procedure, except for rare brief (<30 seconds) periods of apnea during induction. They received supplemental oxygen through a nasal hood (approximately 6 to 8 L/min), and only rarely was nitrous oxide administered. No other inhalational agents were used. No patients were intubated either electively or emergently.

All patients were monitored using a three-lead electrocardioscope, automatic sphygmomanometer, pulse oximeter, and a properly positioned precordial stethoscope. The surgical team consisted of a third- or fourth-year oral surgery resident, a trained assistant, and an attending oral and maxillofacial surgeon.

Patients were allowed to walk with assistance to a separate recovery area after completion of the surgery. They were discharged in the company of their escort once they were alert and oriented, able to walk without assistance, and when vital signs had returned to their preoperative levels.

Results

During the 4-year period that was reviewed, there were 1,126 general anesthesia cases. There were 26 recorded incidents of morbidity (2.3%), none of which resulted in any postoperative sequelae (Table 1). There were no mortalities.

The most common complication encountered was laryngospasm, with nine recorded incidents (0.8%). However, seven of these were managed with suction only, and two were managed with positive pressure and oxygen. The administration of succinylcholine was not required for any of the nine incidents.

The second most common complication was cardiac dysrhythmia, with eight recorded incidents (0.7%). There were four cases of sinus tachycardia, one case of multiple premature ventricular contractions (PVCs)

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Abbreviations: CHF, congestive heart failure; CVA, cerebrovascular accident.
(4 to 5/minute), two cases of sinus arrhythmia, and one case that had temporarily inverted P-waves. All cases of cardiac dysrhythmia resolved spontaneously, without any medical intervention, and all patients remained stable, with no significant symptoms or deviation in vital signs.

Respiratory obstruction was the third most common complication with four recorded incidents (0.4%). Three of these cases resolved with placement of a nasopharyngeal airway. The fourth case of required termination of the surgical procedure, along with multiple attempts at tongue repositioning and suctioning of the pharynx. On awakening the patient, a large hematoma of the uvula was observed, necessitating evaluation by the otolaryngology department. The hematoma was believed most likely to be caused by vigorous suctioning, and it resolved spontaneously within several days. This patient was the only 1 of the 1,126 patients who received general anesthesia that required evaluation in the hospital.

There were two recorded cases of vasovagal syncope, both of which occurred immediately after intravenous catheter placement (0.2%). One case resolved with Trendelenberg positioning and oxygen administration, and the second required the administration of atropine 0.5 mg intravenously in addition to positioning and oxygen.

One patient experienced angina on emergence from anesthesia (0.1%). This resolved with the administration of sublingual nitroglycerin. Another patient experienced hypotension that required treatment with intravenous atropine and ephedrine (0.1%). No patients experienced hypertension that required medical intervention. A single case of vomiting occurred after induction (0.1%); however, no aspiration of gastric contents occurred, and the surgery was continued without any sequelae.

**Discussion**

It appears that anesthetic morbidity in a training program is no greater than that of private practice; both appear to cause no mortality and extremely low morbidity, with a similar incidence and distribution of adverse events occurring in each of the two groups. This similarity seems to substantiate the safety of outpatient anesthesia when attention is paid to proper patient selection, careful monitoring, and the judicious titration of anesthetic agents.

Our method of allowing the patient to breathe spontaneously throughout the procedure is consistent with the results of D'Eramo's Massachusetts survey, which showed that of 416,561 patients treated, none were electively intubated, and only one underwent emergency intubation.

All surgery in our institution was performed with the patients in the sitting position, with the chair tilted backward about 30° from the perpendicular and the occlusal plane of the mandible parallel to the floor. The mandible was actively positioned forward by the anesthesia assistant. It is our belief that proper chair, head, and mandible position are paramount in maintaining a patent airway, and thereby preventing foreign material from irritating the vocal cords and resulting in laryngospasm. Lytle and Stamper's 1988 survey showed that 20.5% of the Californian oral surgeons performed surgery with the patient sitting upright, 44.9% had the patient reclined 45°, and 35.7% had the patient fully supine. They went on to state: "There does not appear to be any correlation between patient position and morbidity and mortality during office general anesthesia."

As noted by other authors, airway problems (obstruction and laryngospasm) also accounted for one half of all complications experienced in this study. All of these problems were recognized and managed promptly, thus averting the need for succinylcholine administration or intubation.

Cardiac dysrhythmias were the second most common anesthetic problem, which is consistent with previous studies. Because all of these patients remained stable, with no other symptoms and no changes in vital signs, treatment other than reassessing proper oxygenation and local anesthesia was not necessary.

Syncope was most likely an underreported event, with only three incidents in 1,126 cases. The actual incidence of syncope at the time of intravenous catheter placement was probably slightly higher than reported. Because presyncopal episodes are seen so frequently during local anesthetic administration, documentation of this particular problem was probably somewhat lax.

As with most retrospective studies, there were certain limitations associated with the collection of data in this study. At our institution an anesthetic record similar to that used in most hospital operating rooms is maintained for each patient. A "comments" section on this record is used to record any untoward events. It is quite possible that numerous incidents of "minor" airway obstruction, partial laryngospasm, dysphoria, and other events might have been easily treated intraoperatively without sequelae and thus are not reported in the anesthetic record.

Many different residents acted as the responsible surgeon during this 4-year period, and it is possible that this may have led to some differences in surgical and anesthetic techniques, with differing morbidity rates. However, because our goal was to assess the safety record of a training program, the variety of surgeons involved was a realistic portrayal of most residency training programs.

The fine line between deep sedation and general
anesthesia must be acknowledged. We only included those cases in which the patients were judged to have lost their protective reflexes, were unable to maintain an airway independently, and were unable to respond purposefully to command. The distinction between deep sedation and general anesthesia is a judgment call, and it is possible that some cases of general anesthesia were omitted and that some cases of deep sedation were included. However, the determination as to what level of anesthesia the patient received was made and recorded at the time of surgery by the attending surgeon, and therefore, the incidence of improper categorization should be low.

The low incidence of anesthetic-related morbidity seen in this study can most likely be attributed to proper patient selection. A carefully reviewed medical history and physical examination are the two most useful methods to prevent anesthetic emergencies. In our institution, only ASA status I and II patients are considered for outpatient general anesthesia, with ASA III patients generally being treated with local anesthesia only, local anesthesia with conscious sedation or, when necessary, in the hospital setting. Other factors considered when selecting the proper anesthetic method include the length and difficulty of the surgical procedure, with outpatient general anesthesia being reserved for those procedures that are predicted to be relatively short (30 to 45 minutes) and with little potential for airway difficulties secondary to patient position, hemorrhage, and irrigation.

Another factor to which our low morbidity can be attributed is vigilant patient monitoring, both electronically (electrocardiogram, pulse oximeter, automatic sphygmomanometer) and visually (observing respiratory patterns, etc.). In addition, the patient’s respiratory status was monitored with a properly placed precordial stethoscope.

Profound local anesthesia is an absolute necessity when performing outpatient oral surgery procedures under general anesthesia. This allows much smaller doses of methohexital to be used and thus maintain the patient in a lower plane of general anesthesia, and also decreases recovery time.

A team of three qualified persons being present during all general anesthesia cases also contributed to the low morbidity. Because this is a resident training program, an oral and maxillofacial surgery resident, attending staff member, and trained surgical assistant operated as a team during all cases.

In addition to its safety and efficacy, general anesthesia in the outpatient setting is highly cost-effective with proper patient selection, vigilant monitoring, presence of appropriate personnel, and judicious titration of the anesthetic agents, the surgical removal of four impacted third molars in the office costs approximately one fifth as much as in the typical hospital ambulatory surgical unit. In this time of “downsizing” and cost-containment, as this nation comes to terms with the enormous burden that rising hospital costs have placed on the federal, state, and local budgets, more and more attention needs to be focused on doing procedures safely and effectively in the most economical fashion.

References

Discussion

Morbidity and Mortality With Outpatient Anesthesia: The Experience of a Residency Training Program

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Drs Hunter and Molinaro have produced a significant article that adds additional data to a growing body of knowledge concerning morbidity and mortality associated with outpatient general anesthesia as it is applied to the practice of oral and maxillofacial surgery. The article describes how that training program teaches residents to administer outpatient general anesthesia in a manner very similar and consistent with the method most commonly being practiced by a majority of oral and maxillofacial surgeons. The techniques of patient position, medications used, and modalities of monitoring are consistent with those currently advocated. The major difference in the teaching setting versus private practice is that a supervising attending surgeon oversees the resident performing the anesthesia, the anesthesia team has not had a great amount of experience, and there is usually a