Complications of Moderate Sedation Versus Deep Sedation/General Anesthesia for Adolescent Patients Undergoing Third Molar Extraction

Gino Inverso, DMD, [*] *Thomas B. Dodson, DMD, MPH,* [†] *Martin L. Gonzalez, MS,* [‡] *and Sung-Kiang Chuang, DMD, MD, DMSc* [§]

Purpose: To examine the complications resulting from moderate sedation versus deep sedation/general anesthesia for adolescent patients undergoing third molar extraction and determine whether any differences in complication risks exist between the 2 levels of sedation.

Materials and Methods: We performed a prospective study of the Oral and Maxillofacial Surgery Outcomes System from January 2001 to December 2010. The primary predictor variable was the level of sedation, divided into 2 groups: moderate sedation versus deep sedation/general anesthesia. The primary outcome was the incidence of adverse complications resulting from the sedation level. Differences in the cohort characteristics were analyzed using the independent samples *t* test, χ^2 test, and analysis of variance, as appropriate. Multivariable logistic regression was used to measure the effect the level of sedation had on the adverse complication rate.

Results: Patients in the moderate sedation group had a complication rate of 0.5%, and patients in the deep sedation/general anesthesia group had a complication rate of 0.9%. Compared with moderate sedation, deep sedation/general anesthesia did not pose a significantly increased risk of adverse anesthesia complications (adjusted odds ratio 1.63, 95% confidence interval 0.95 to 2.81; $P = .077$).

Conclusions: The results of our study have shown that the risk of adverse anesthesia complications is not increased when choosing between moderate and deep sedation/general anesthesia for adolescent patients undergoing third molar extraction.

J Oral Maxillofac Surg 74:474-479, 2016

During the extraction procedure, it is the responsibility of the oral and maxillofacial surgeon (OMS) to safely and effectively deliver anesthesia to the patient. For the extraction of third molars, the sedation levels include light, moderate, and deep sedation/general anesthesia. The choice of anesthetic regimen and level of sedation generally lies with the OMS and is determined by the medical history, procedural difficulty, patient anxiety, the patient's anesthetic preference, the patient's financial limitations, and the number of teeth to be extracted.[1,2]

The administration of anesthetics for the adult patient is different from the administration of anesthetics for pediatric and adolescent patients. For pediatric and

[*]Postgraduate Year 1 Resident, Department of Oral and Maxillofacial Surgery, Hospital of the University of Pennsylvania, Philadelphia, PA.

[†]Professor and Chair, Department of Oral and Maxillofacial Surgery, and Associate Dean for Hospital Affairs, University of Washington School of Dentistry, Seattle, WA.

[‡]Senior Research Associate, American Association of Oral and Maxillofacial Surgeons, Rosemont, IL.

[§]Associate Professor, Harvard School of Dental Medicine; and Director, Center for Applied Clinical Investigation, Massachusetts General Hospital, Boston, MA.

Conflict of Interest Disclosures: None of the authors reported any disclosures.

Address correspondence and reprint requests to Dr Inverso: Department of Oral and Maxillofacial Surgery, University of Pennsylvania, Perelman Center for Advanced Medicine, 4 South Pavilion, 3400 Civic Center Boulevard, Philadelphia, PA 19104; e-mail: gino.inverso@uphs.upenn.edu

Received August 11 2015

Accepted October 10 2015

0278-2391/15/01372-5

http://dx.doi.org/10.1016/j.joms.2015.10.009

adolescent patients, anesthetic administration can entail a low level of cooperation and increased levels of fear and anxiety. Additionally, the safety and effects of anesthesia are often difficult to evaluate. Data on the pharmacokinetics and pharmacodynamics have commonly been derived from studies of adult humans and animals, making the data difficult to extrapolate and apply to pediatric and adolescent populations.[3] Accordingly, it is critical that anesthesia trends in use and outcomes be monitored longitudinally to ensure the safety of vulnerable populations.

The American Association of Oral and Maxillofacial Surgeons (AAOMS) established the Oral and Maxillofacial Surgery Outcomes System (OMSOS), with the goal of "tracking national practice trends, estimating risk-adjusted outcomes of care, and determining associations between alternative processes of care and outcomes of care."[4] Although previous data have focused on reporting anesthesia practices of OMSs in the ambulatory setting, studies have yet to risk-stratify adverse anesthesia complications for adolescent patients.[4] Additionally, existing studies have included small sample sizes, making it difficult to understand and appreciate the true risk of the occurrence of adverse events.[5]

The purpose of the present study was to examine the complications resulting from moderate sedation versus deep sedation/general anesthesia for adolescent patients undergoing third molar extraction. We also sought to determine whether any differences in complication risk exist between the 2 levels of sedation. We hypothesized that no significant difference would be found in adverse risk when using moderate sedation versus deep sedation/general anesthesia for third molar extraction. In comparing the 2 sedation levels (moderate sedation vs deep sedation/general anesthesia), our aims were to document the type and frequency of anesthetic use, calculate the anesthesia complication rate, and model the risk of adverse complications for each level of sedation.

Materials and Methods

STUDY DESIGN AND SAMPLE

The institutional review board approved the study protocol (approval no. IRB14-3596). Our study was a prospective cohort study with data collected through the OMSOS, commissioned by the AAOMS. The methods of data collection for the OMSOS have been previously described.[4] In brief, a total of 79 surgeons in 58 sites across the 6 AAOMS districts participated in the data collection. The clinical settings eligible for study participation included community, dental school, and hospital-based practices. The cohort of subjects was derived from patients enrolled in the OMSOS from January 2001 to December 2010. To be included in the study cohort, the subjects had to be adolescent patients (defined as age <21 years) undergoing third molar extraction procedures in the ambulatory setting. Subjects were excluded from the study cohort if they only received local anesthesia, had teeth other than third molars extracted, and/or if third molar extraction was combined with other procedures.

STUDY VARIABLES

The primary predictor variable was the level of sedation, divided into 2 groups: moderate sedation versus deep sedation/general anesthesia. The level of sedation was recorded as documented by the OMSOS data set.

Moderate sedation was defined as a minimally depressed level of consciousness produced by a pharmacologic or nonpharmacologic method, or combination, that retained the patient's ability to maintain their airway independently and continuously and allowed the patient to respond appropriately to physical stimulation and/or verbal commands. Deep sedation/general anesthesia was defined as an induced state of depressed consciousness produced by a pharmacologic or nonpharmacologic method, or combination, that produced a partial loss of protective reflexes, including an inability to maintain an airway independently and/or to respond purposefully to physical stimulation and/or verbal commands. General anesthesia was defined as an induced state of unconsciousness produced by a pharmacologic or nonpharmacologic method, or combination, producing a partial or complete loss of protective reflexes, including the inability to continually maintain an airway independently and to respond purposefully to physical stimulation or verbal commands.[4,6,7] For the purposes of the present analysis, the deep sedation and general anesthesia groups were combined.

STUDY OUTCOME

The primary outcome was the incidence of adverse complications resulting from anesthesia. Complications included vomiting with and without aspiration during induction and/or maintenance, vomiting with and without aspiration during recovery, laryngospasm, bronchospasm, respiratory arrest and/or hypoventilation requiring intervention, new cardiac dysrhythmia requiring intervention, syncope, seizure, neurologic impairment, prolonged emergence from anesthesia, and peripheral vascular injury.

OTHER VARIABLES

The other study variables included subject age, gender, anesthetic risk classified using the American Society of Anesthesiologists (ASA) physical status