

Five Year Outcomes Study of Dental Rehabilitation Conducted Under General Anesthesia for Special Needs Patients

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We assessed the safety of general anesthesia for dental treatment of special needs patients as it related to American Society of Anesthesiology Physical Status (ASAPS) classification, procedure, and other factors. After Institutional Review Board review and approval, special needs patients who were admitted to the outpatient surgical operating room for comprehensive dental rehabilitation (CDR) under general anesthesia within a period of 5 years had their medical records evaluated retrospectively for intraoperative and postoperative complications both related to anesthesia and surgery. All records were evaluated by an independent evaluator who tabulated the patients' age, gender, ASAPS, and duration of procedure. N = 363, age mean = 46.93 ± 16.835 years, age median = 48 years, male patients = 180, female patients = 183, ASAPS I = 183, ASAPS II = 127, ASAPS III = 53, duration of surgery mean = 140.631 ± 23.104 minutes, duration of surgery median time = 142.000 minutes, and number of complications = 2. One complication resulted in an ASAPS I 16-year-old boy, which was airway related, and a second was an ASAPS III 22-year-old woman, which was surgically related. Both led to unplanned inpatient admissions and were treated successfully with no residual morbidity. Dental rehabilitation of special needs patients under general anesthesia is safe. While morbidity is very low, larger studies are needed to establish risk versus benefit stratification among this patient population.

Key Words: Special needs; Dental; General; Anesthesia.

Patients with mental and physical limitations often pose a challenge when presenting for dental treatment. Lack of cooperation, combative behavior and physical limitations can make conventional office-based comprehensive dental treatment under local anesthesia very

difficult and sometimes impossible. To avoid the risks of injury or excessive stress as well as the inability to provide high quality and well-delivered dental care, dentists often resort to the management of their special needs patients under general anesthesia.^{1,2} The anesthesiology and surgical literature often addresses the risk for anesthesia as it relates to the patient's overall health status often described through the American Society of Anesthesiology Physical Status (ASAPS) classification and the degree of surgical complexity. Due to the nature of the rendered treatment that seldom involves highly invasive procedures or significant hemodynamic changes, comprehensive dental rehabilitation (CDR) is usually described as a minimally invasive procedure. Despite such a percep-

An abstract of this study was presented in the IADR dental anesthesiology research group meeting June, 2006 in Brisbane, Australia (abstract#1953).

Received February 1, 2007; accepted for publication September 7, 2007.

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Anesth Prog 54:170-174 2007

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ISSN 0003-3006/07/\$9.50

SSDI 0003-3006(07)

tion, the special needs population has its own unique challenges which may not necessarily correlate with the generally agreed upon criteria for anesthetic risks.^{3,4,5} Preoperative medical, surgical, and preanesthetic evaluations are usually very difficult and often less than comprehensive. It is important for the dental community to establish a risk versus benefit assessment for conducting such procedures while identifying the elements of risk that are unique to this patient population.

The objective of this study was to retrospectively assess the safety of conducting general anesthesia for comprehensive dental treatment of the special needs patients as it related to the ASAPS and type and duration of procedure. The study also aimed at identifying unique elements of the special needs dental patient that can contribute to anesthetic risks.

METHODS

The approval of the Institutional Review Board Human Subjects Committee at the University of Illinois at Chicago was first obtained by the investigators prior to conducting this study. Medical records belonging to special needs patients who were admitted to the University of Illinois at Chicago for comprehensive dental rehabilitation under general anesthesia within the period of 5 years were retrospectively evaluated by one of the investigators in this study. The dental treatment was conducted routinely by the general practice residents at the medical center. The evaluator was independent and had not been involved in rendering of care to any of the research subjects. Data were collected from every record included:

- (a) age
- (b) gender
- (c) ASAPS classification
- (d) duration of anesthesia
- (e) any intraoperative or postoperative morbidity, its nature and the intervention needed.

Data were tabulated and analyzed. Any records that had any aspect of the information not clearly legible were eliminated from the data analysis; however, all retrieved records were looked at for morbidity events.

RESULTS

Four hundred twenty-five medical records were retrieved and reviewed. Data from 363 records were analyzed and tabulated. Data from 62 records were left out of the data analysis process due to the inability of the evaluator to tabulate, with certainty, one or more of

Anesthesiology Physical Status Classification (ASAPS)

	ASAPS I	ASAPS II	ASAPS III
No. of patients	183	127	53

N = 363.

the evaluation criteria: N = 363, age mean = 46.93 ± 16.835 years, age median = 48 years, male patients = 180, female patients = 183, duration of surgery mean = 140.631 ± 23.104 minutes, duration of procedure median time = 142.000 minutes. See the Table for ASAPS.

Two morbidities were noted in the reviewed records. The nature of the events and the intervention needed will be discussed in more detail as case 1 and case 2. It is worth mentioning that despite excluding 62 records from the data analysis, none of those records had any intraoperative or postoperative morbidity, and all were uneventful from the anesthetic and procedure standpoint.

CASE 1

A 16-year-old boy presented with a past medical history significant for profound mental retardation without any other systemic diseases. He was brought to the operating room after attempts to provide dental care in the outpatient clinic failed due to his uncooperative behavior. After following the usual preanesthesia preparation guidelines, the patient was brought to the same-day surgical suite at the University Medical Center. His induction included intramuscular presedation with ketamine, midazolam, and glycopyrrolate.

Intravenous access was achieved and general anesthesia was induced with intravenous agents. At the point of general anesthesia induction, the patient was stable and easy to ventilate and maintain excellent oxygen saturation as monitored via pulse oximetry. The patient was given a nondepolarizing muscle relaxant in preparation for nasotracheal intubation. Upon the attempted intubation it was realized that the patient's temporomandibular joint had limited opening. This was not discovered preoperatively since the patient was not cooperative in allowing the anesthesia team to fully evaluate his airway. Attempts to intubate him via direct laryngoscopy failed, and the decision was made to resort to fiberoptic intubation. Throughout this process the patient continued to maintain oxygen saturation between 98 and 100% via pulse oximetry at 100% FiO₂.

After successfully intubating him, it was noted that breath sounds were more audible on the left side, and

the patient's oxygen saturation dropped but never went below 88%; it remained stable around 92%. However, the oxygen saturation was not improving even with 100% FiO₂. A portable chest radiograph was obtained and revealed a total collapse of the right lung. Although the actual cause of the lung collapse was not fully understood, it was thought that a mucous plug might have been the primary cause since the intubation process was fairly atraumatic, and the endotracheal tube was guided via a fiberoptic scope with a confirmation that it was not advanced into the right main bronchus. The right main bronchus was suctioned and irrigated with saline and acetylcysteine (Mucomist) to remove any possible mucous secretions.

Otolaryngology and cardiothoracic surgeons were consulted and a flexible bronchoscopy was accomplished as well as further irrigation of the right lung. This resulted in reinflation of the right upper lobe of the right lung and improvement of the oxygen saturation to greater than 95%. The decision was made that the patient would be kept sedated and intubated overnight to ensure the complete reinflation of his right lung. The otolaryngologist decided that due to his uncooperative behavior and the difficulty of his airway, it was best to perform an elective tracheostomy to avert the possible self-extubation and loss of airway.

After performing the tracheostomy, the patient was admitted to the medical intensive care unit under the pulmonology service. The inpatient admission course was uneventful except for the total reexpansion of the right lung within a few hours. The patient was stable throughout the whole admission. He was taken the next day to the operating room where he underwent general anesthesia to complete his dental treatment. He was discharged 3 days later with follow-up scheduled both in the dental and otolaryngology clinics. His tracheostomy was discontinued and he healed very well without any residual deficits or complications.

Discussion of Case 1

This is an example of some of the difficulties that managing cognitively challenged patients might pose. This particular patient had limited mandible opening of unknown origin that was never reported by his family members in the preoperative appointment, and he was not cooperative to allow the anesthesiology staff to fully assess his airway. Traditionally, in cases of severe atelectasis or lung collapse, it is sufficient to control the airway via endotracheal intubation. The mental status of this patient paired with his poor maximal

mouth opening compelled the managing surgeons to perform a tracheostomy as a more aggressive measure to ensure full control over his airway during the hospital admission.

Being prepared for the unknown with the special needs patients is very important. Alternative methods in dealing with unanticipated difficult airways or other challenges that might arise during the anesthetic management are very important. Many dental procedures conducted in the office-based setting where endotracheal intubation is conducted are done so without the use of a paralyzing agent as a safety measure in case of anesthetic or airway difficulty. Canceling the procedure and quickly restoring the patient's ability to breathe spontaneously and maintaining airway integrity are often easier when the patient has not received a paralytic agent. Paralytic agents must be available to treat an event such as severe laryngospasm, however. Alternative airway management devices such as a laryngeal mask airway or an endotracheal tube introducer (eg, gum-elastic bougie) could be extremely useful in such situations, especially in the absence of a fiberoptic scope. Emergency cricothyrotomy kits are also potentially very useful in case of an airway loss.

Unexpected anesthetic challenges can arise in the special needs population due to many factors, some of which are:

- (a) Limited preanesthesia assessment of airway and general physical condition.
- (b) Limited medical risk assessment due to lack of cooperation or lack of access to medical support systems.
- (c) Lack of compliant care-taker network to ensure preanesthesia and postanesthesia compliance.

CASE 2

A 22-year-old woman presented with a past medical history significant for severe neuromuscular deficits since birth, leaving her wheelchair bound with spasticity, seizure disorder, and severe cognitive deficit. This patient also had a history of iron deficiency anemia with a baseline hemoglobin concentration of 8.8 g/dL. Conducting an examination and dental treatment on the patient in the dental clinic was not possible due to severe lack of cooperation and the patient's high stress level. It was noted that the patient had severe gingival enlargement due to a long history of antiseizure medication use, as well as dental caries. The examination was limited in assessing the degree of severity. A decision was made to perform the dental exam and treatment in the operating room under general anesthesia.

Due to the patient's poor venous access and lack of cooperation, a hemoglobin concentration was very hard to obtain before the date of the procedure. All preanesthesia preparation protocols were followed in coordination with her parents and the primary care physician. The induction and intraoperative course of anesthesia was uneventful with general anesthesia and nasotracheal intubation as the chosen approach. Upon obtaining intraoral radiographs and conducting a detailed dental examination, the patient was found to have multiple impacted and unerupted secondary teeth with a retained partially resorbed primary dentition. Multiple cystic lesions were found around several of the impacted secondary teeth.

The treatment plan was formulated to extract the retained primary teeth and several of the impacted secondary teeth as well as for the removal of the lesions for pathologic evaluation. The oral and maxillofacial surgery service was consulted and asked to perform a portion of the surgical extractions and biopsies. The patient was started on intravenous antibiotics, and a decision was made to admit her overnight for observation due to the unexpected severity of the surgery and her complex medical history. Her vital signs were stable throughout the whole procedure.

An immediate postoperative hemoglobin concentration was 5.9 g/dL. The patient was transfused one unit of packed red blood cells (PRBC) and was kept for observation for 2 days postoperatively. She continued to receive intravenous antibiotics during the course of her admission to prevent the development of odontogenic infections. Despite the drop in hemoglobin and the development of a low-grade fever the first night of admission, the patient was stable throughout her course of admission and did well postoperatively.

Discussion of Case 2

This is a case of a patient with a severely medically compromised medical history. Due to her lack of cooperation she was not amenable to treatment or even a comprehensive examination in the outpatient clinic. The severity of the dental procedure was only fully appreciated after the patient was under general anesthesia. The complex surgical findings coupled with the history of anemia led to the change in admission planning from same-day ambulatory surgery to a 3-day admission with intravenous antibiotics and the transfusion of one unit of PRBC.

It is not uncommon that dentists commence treatments such as this on this patient population without a clear idea of the complete dental needs. Many patients who need such a level of care cannot cooperate

enough with the treating dentist to allow a comprehensive examination. This opens the door for possible surgically related complications due in part to:

- (a) Surgical "surprises" making the stratification of risk and the estimation of procedure time very difficult.
- (b) Undiagnosed dental and oral diseases that require more aggressive intervention.
- (c) Poor after-care and compliance that can complicate what otherwise would be considered routine care.

DISCUSSION

The published literature has addressed the risk of general anesthesia in the dental office.^{3,4} There is ample data that can prove its remarkable track record. Data show that risk for death from general anesthesia in that setting is far less than the overall risk for anesthesia death. It is reasonable to speculate that patients seen in such a setting are predominantly ASAPS I and II and the proven track record of patient selection acceptable to such a setting. Special needs patients sometimes do not fit this category.⁶ There is no clear dental literature to associate the relative risk for those patients, yet one can understand from the anesthesia studies that there is certainly an increased risk for general anesthesia especially for ASAPS higher than II.^{7,8,9,10}

How frequently should we recommend a patient undergo general anesthesia for prophylaxis and exam? Most special needs dental patients have very poor dental compliance and would benefit from frequent recalls; however, does that require these patients to undergo general anesthetic every 6 months for the rest of their lives? Access to operating room time and surgicenter facilities might present a challenge and cause an overload to this already strained system. While in the larger scheme of surgical risk assessment, dental procedures could be considered as minimally invasive, the above stated risk factors can create a larger challenge to the managing dentist and anesthesiologist.^{11,12,13} The perception that dental procedures are noninvasive and relatively low risk might create a false sense of comfort and distract some physicians from the inherent risks of the existing medical, mental, and physical conditions.

Loyola-Rodriguez et al¹⁴ recently published a classification for dental treatment under general anesthesia. Their classification primarily addressed the duration of treatment and severity of required treatment. This commendable effort is certainly a step in the right direction.

Adams and Smith¹² stated that if a patient's consent for treatment is to be truly informed, then the patient

must be aware of the possible risks of the proposed treatment as well as the expected benefits. It is our duty to patients to explain to them in nontechnical terms the risks and benefits of the procedure. There is still considerable controversy in the literature regarding the comparative merits of using relative risk and absolute risk.^{12,15,16,17,18} Patients' perceptions of those relative risks may be affected by other external factors. It is very important to recognize that when assessing the risk for a procedure, not to just consider the dental risks but to fully understand the risks for anesthesia as well.

CONCLUSION

General anesthesia for CDR performed in a major teaching medical center is safe and necessary. It is important to stratify the level of risk versus benefit and explain both to the patient or family member. Larger multicenter prospective studies are needed to adequately stratify the level and cause of such risks.

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