Anesthesia and Safety Considerations for Office-based Cosmetic Surgery Practice

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With more surgical procedures than ever before being performed in office settings, office-based anesthesia is a rapidly growing area of anesthesia practice. Although there are many advantages to office-based practice, limitations inherent to this setting, if not recognized and addressed, may threaten patient safety. The demand for cosmetic surgery is considered one of the driving factors in the exponential growth of office-based anesthesia. Anesthesia for cosmetic surgery procedures in the office setting is frequently performed under monitored anesthesia care (MAC) with its own unique safety considerations. Anesthetists practicing in office-based cosmetic surgery practices must understand the special characteristics of this setting, the MAC-based approach often used, the anesthesia and safety considerations for the cosmetic surgical procedures performed, and the importance of prophylaxis for venous thromboembolism.

Keywords: Cosmetic surgery, monitored anesthesia care, office-based anesthesia, off-site anesthesia, venous thromboembolism prophylaxis.

Objectives
At the completion of this course, the reader should be able to:
1. Identify key differences and implications for practice between office-based anesthesia practice and hospital- or surgery center-based practice.
3. Discuss anesthesia and safety implications for the provision of monitored anesthesia care in the office-based cosmetic surgery setting.
4. Formulate anesthesia and safety considerations for commonly performed cosmetic surgical procedures.

Introduction
Presently considered a rapid growing specialty area of anesthesia, office-based anesthesia has been in existence in the United States for almost 100 years.1-3 Oral surgery exemplifies office-based practice, especially from the 1930s to the present.2,4 Office-based cosmetic surgery has been in existence since at least the 1960s, with the demand for cosmetic surgery considered a driving force for the exponential increase in office-based surgery and anesthesia.3,5 In recent years, office-based surgery has seen phenomenal growth, with as many as 25% of all surgical procedures in the United States now performed in the office setting.4 Office-based cosmetic surgical procedures increased 234% from 1992 to 2008.6 In 2010, 69% of all cosmetic surgery procedures were performed in physicians’ offices.7

The intent of this Journal course is to discuss anesthesia and safety considerations pertinent to office-based cosmetic surgery. Topics include an examination of the office-based environment, patient and procedure selection, and the use of monitored anesthesia care (MAC). Cosmetic procedures and prophylaxis for venous thromboembolism (VTE) are also discussed.

Differences Between Office-based and Hospital- or Surgery Center–based Anesthesia Practice
The office-based setting has numerous advantages and disadvantages as compared with hospitals and ambulatory surgery centers (ASCs). Factors that help explain the growth of office-based surgical practice include
decreased costs, increased patient and surgeon convenience and satisfaction, consistent staffing, efficiency, patient privacy, increased autonomy of practice, and decreased risk of infection.\(^1\),\(^2\),\(^8\)-\(^15\) Aging of the population and resultant increased demand for cosmetic surgery are also major drivers of demand.\(^3\) Office-based practice has particular disadvantages that if not recognized and addressed may threaten the safe care of patients. Disadvantages include absent or inconsistent state regulatory oversight, lack of peer review and credentialing, and logistical limitations.\(^1\),\(^2\),\(^10\)-\(^13\),\(^16\) A lack of uniform state regulations affecting office-based surgery can allow practitioners to perform procedures in the office for which they would not be credentialed in a hospital.\(^8\),\(^9\),\(^17\) for example, a family practice physician or a dentist performing liposuction.

As of 2009, approximately 25 states and the District of Columbia had instituted regulations to address surgery and anesthesia in office locations.\(^18\) Regulations vary from state to state and may regulate aspects of the facility, providers, and/or procedures and patient selection. Regulations may address equipment requirements, facility specifications, emergency procedure policies and training, limitations on the duration of procedures, limitations on the amount of liposuction performed, provider qualifications, and facility accreditation or licensing requirements. It is the responsibility of anesthesia providers to comply with state regulations affecting their practice.\(^1\),\(^4\),\(^11\) State boards of nursing, the state and national offices of the AANA, and an anesthetist’s malpractice insurance carrier are good first stops for becoming familiar with individual state requirements.

The typical office-based setting also lacks the personnel support and material resources that an average surgery center or hospital has at its disposal, including code teams, laboratory support, and radiology.\(^19\),\(^20\) Cost constraints from single-physician practices might limit the amount and quality of equipment available for routine and emergency patient care.\(^19\) Anesthesia providers thus must ensure that the particular office setting will meet the routine and possible emergency needs of any prospective patient considered a candidate for surgery (Table 1).\(^4\),\(^21\)

Office-based surgery practices also lack the organizational resources and human infrastructure of surgery centers and hospitals such as credentialing departments and infection control committees. It is thus the responsibility of the surgeon, anesthetist, and nursing staff to ensure that appropriate mechanisms are in place for quality assurance and improvement. The office venue is also likely characterized as a solo provider position requiring the anesthetist to practice in an independent manner without the possibility of anesthesia backup if a problem arises.\(^11\) An anesthetist entering into such practice should ensure that all required monitors, equipment, and supplies are sufficient for routine and emergency patient care.\(^4\),\(^22\) Policies for routine and emergency procedures should be in place, and the staff should be trained.\(^4\)

Emergency procedure policies should address topics such as malignant hyperthermia and advanced cardiac life support protocols, emergency evacuation of patients, and operating room (OR) fires. Routine policies should address patient selection and evaluation, infection control, recovery and discharge of patients, provider credentialing, quality assurance and improvement, and medical records maintenance.\(^3\),\(^4\)

Before committing to practice in this setting, an anesthetist must ensure that the total practice environment is appropriate for safe and effective patient care.\(^21\) Standards for office-based anesthesia practice are available for reference on the AANA website.\(^21\) The American Society for Aesthetic Plastic Surgery requires its members to practice in accredited facilities.\(^19\) The 3 principal accreditation organizations are the American Association for Accreditation of Ambulatory Surgical Facilities, the Accreditation Association for Ambulatory Health Care, and the Joint Commission.\(^23\),\(^24\) Accreditation imposes a set of regulations on an organization for the purpose of ensuring high-quality, safe patient care. State licensure, depend-

<table>
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<th>Table 1. Assessment of Safety and Suitability of Office-based Practice Setting(^{1,4,11,14,21})</th>
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<tbody>
<tr>
<td><strong>Supplies and equipment</strong></td>
</tr>
<tr>
<td>Adequate oxygen supply (2 H tanks at minimum)</td>
</tr>
<tr>
<td>Suction dedicated for anesthesia</td>
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<tr>
<td>Positive pressure ventilation device (self-inflating bag-valve-mask device at a minimum)(^4),(^14)</td>
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<tr>
<td>Monitor/defibrillator</td>
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<tr>
<td>Full complement of OR and PACU monitors</td>
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<tr>
<td>All equipment maintained and inspected according to manufacturer’s requirements</td>
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<tr>
<td>Adequate stock of routine and emergency medications</td>
</tr>
<tr>
<td>Complete supply of airway and intravenous devices and supplies</td>
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| **Personnel**                                                |
| Surgeon board certified in specialty of practice with own malpractice insurance |
| Licensed nursing staff in the OR and PACU                   |
| Key clinical staff certified in ACLS                         |
| Nurse anesthesia practice compatible with state laws and nursing regulations |

Abbreviations: OR, operating room; PACU, postanesthesia care unit; ACLS, Advanced Cardiac Life Support.
The practice of office-based anesthesia is associated with cosmetic surgery practice. Monitored Anesthesia Care (MAC) in the office-based setting is outlined in Table 2. Relative and absolute contraindications to MAC are considered ineffective.1,4,22,27,28,33 Relying on clinical signs to monitor ventilation is inadequate monitoring of ventilation having a significant role.33,35 Relying on clinical signs to monitor ventilation is not reliably reflect the adequacy of ventilation. In the presence of supplemental oxygen administration, a variable lag time is observed of up to 240 seconds between the onset of respiratory depression and the onset of hypoxia.28,34,36-38 The end-tidal carbon dioxide monitor is a monitor of ventilation, and its use has been shown to significantly reduce the incidence of hypoxic events and allow for intervention during the beginning stages of a ventilatory problem.34,36-39 Care deficiencies cited in the aforementioned closed claims analyses suggest that inadequate ventilation and oxygenation may be the most common causes of anesthesia-related severe injury and death in remote areas and office-based settings, with inadequate monitoring of ventilation having a significant role.33,35
studies included oversedation, ineffective monitoring of ventilation and oxygenation, and delayed or inappropriate rescue responses. Many of the deaths thus might have been prevented through more skillful and appropriate administration of MAC, better monitoring of ventilation and oxygenation, and earlier rescue.

The number of claims for complications associated with MAC have resulted in challenges of the traditional view of MAC as being easier to administer and safer than general anesthesia. Reflecting the importance of ventilatory monitoring, the American Society of Anesthesiologists published practice guidelines in July 2011 calling for monitoring of end-tidal carbon dioxide in patients receiving moderate to deep sedation. The implications of these new guidelines and the findings from closed claims studies are clear. Facilities providing moderate to deep sedation anesthesia should use carbon dioxide capnography to monitor ventilatory function.

Commonly Performed Cosmetic Surgical Procedures

- **Breast Augmentation.** Anesthesia for breast augmentation commonly involves local anesthesia and sedation. Intercostal nerve blocks and local anesthesia provide excellent operative and postoperative anesthesia and allow for less use of narcotics, less time to recover, less pain during postanesthesia recovery and at home, and less postoperative nausea and vomiting. Possible complications of breast augmentation include infection, hemorrhage, pneumothorax, and local anesthetic toxicity.

- **Liposuction.** Liposuction is a body-shaping procedure involving the removal of fat deposits to improve body contour. Wetting solution (tumescent solution) is first infiltrated subcutaneously to distend the tissue and soften the fat cells. Epinephrine and lidocaine are usually added to the tumescent solution to provide for hemostasis and analgesia. After infiltration of the tumescent solution, subcutaneous adipose tissue is aspirated to achieve a predetermined sculptured body shape. Safety considerations concern the amount of tumescent solution infiltrated, the amount liposuction performed, and the performance of multiple procedures concomitantly (especially in combination with abdominoplasty).

Usually, 1 mL of epinephrine- and lidocaine-containing tumescent solution is infiltrated for every 1 mL of fat tissue to be removed (superwet technique). The use of epinephrine in the tumescent solution results in approximately 1% to 2% blood loss per volume of aspirate. A “dry technique” (without the use of epinephrine-containing tumescent solution) is associated with as much as 20% to 45% blood loss per volume of aspirate.

A safe upper dose limit for total subcutaneous lidocaine infiltration is 35 mg/kg. The maximum total recommended dose of epinephrine is 0.07 mg/kg. Liposuction aspiration removes approximately 30% of the tumescent wetting solution infused. Thus, for every liter of tumescent solution infiltrated subcutaneously, approximately 700 mL is absorbed and constitutes part of the total fluid volume administered to the patient. It is important to include this surgically administered fluid when considering the combined effects of this volume with the intravenous fluid administered by the anesthetist. Because of the high rate of systemic absorption of tumescent solution, one must be careful not to overhydrate the patient with excessive amounts of additional intravenous fluid. Maintenance fluid requirements may be all that is necessary in this setting.

Risks associated with infiltration of tumescent infiltra-
tion and liposuction aspiration include VTE (the major cause of mortality), anemia, fat embolism, abdominal wall perforation, infection, fluid overload, pulmonary edema, hypothermia, and local anesthetic and epinephrine toxicity.\textsuperscript{11,17,25,26} Risks are believed to increase when the total liposuction aspirate volume exceeds 5 L. Large-volume liposuction beyond 5 L of total aspirate is thus believed to be inappropriate for an office-based location.\textsuperscript{11,12,14,25,29} Patient positioning during liposuction is also challenging in that liposuction of multiple areas or combination procedures often require frequent position changes and prone positioning.\textsuperscript{14,26}

- **Abdominoplasty.** Abdominoplasty consists of the removal of excess abdominal fat and skin and tightening of underlying musculature to allow for a toned, smooth, and firm abdomen. Performance of intercostal nerve blocks and use of local anesthesia by the surgeon facilitates the use of MAC and promotes a smoother and more comfortable recovery.\textsuperscript{3,41}

Abdominoplasty has the highest incidence of death due to VTE compared with other cosmetic surgery procedures.\textsuperscript{29,42} The addition of high-volume liposuction or other procedures with abdominoplasty further increases this risk.\textsuperscript{25,30,42} The overall rate of thromboembolism may approximate 1% as a single procedure and up to 6.6% or more when combined with other procedures.\textsuperscript{30} Gravante et al\textsuperscript{30} found a rate of nonlethal pulmonary embolism of up to 8.8% in patients having large resection abdominoplasty combined with liposuction and with operative times longer than 140 minutes. Reasons cited for the high VTE risk include mechanical forces favoring lower extremity venous stagnation such as flexed surgical positioning, surgical abdominal tightening, and the use of tight abdominal binders postoperatively.\textsuperscript{15} Because of the risk for VTE associated with abdominoplasty, patients should be carefully considered for pharmacological VTE prophylaxis.\textsuperscript{12,14,16,29,31,35,43}

**Facial Cosmetic Surgical Procedures**

Common cosmetic facial procedures include rhinoplasty, blepharoplasty (eyelid surgery), and rhytidectomy (face-lift). These procedures are often performed under local anesthesia and MAC.\textsuperscript{1} During rhinoplasty, cocaine pledgets are often used to shrink the nasal mucosal and decrease bleeding. Nasal packs may also be used to prevent blood from entering the airway. The anesthetist must monitor for a possible sympathetic nervous system response to the topical cocaine and also carefully maintain the airway to prevent blood accumulation and aspiration.

Other anesthesia considerations for cosmetic facial procedures include the prevention of hypertension, swelling, and bleeding. It is common to give clonidine, 0.2 mg, by mouth preoperatively to decrease sympathetic nervous system outflow and allow for lower perioperative blood pressure, swelling, and blood loss.\textsuperscript{14} Dexamethasone is also often given intravenously to help minimize swelling.\textsuperscript{14} Other concerns include the risks of local anesthetic toxicity and intraoperative fire.\textsuperscript{1,11,14,31}

The use of MAC during facial surgery, possible oxygen accumulation under drapes, and the use of electrocautery present the risk of an intraoperative fire. Preventive measures include avoidance of use of flammable skin preparation solutions and avoiding the accumulation of oxygen under the drapes. Good communication should exist with the surgeon to ensure notification of the anesthetist of pending electrocautery use. During such times, the oxygen should be titrated to the lowest possible level consistent with adequate oxygenation.\textsuperscript{3,14,31}

**Mortality Associated With Cosmetic Surgical Procedures**

Numerous studies cite the safety of office-based anesthesia and suggest no greater anesthesia risk than in hospitals.\textsuperscript{3,13,32,42,44-46} The overall mortality associated with office-based cosmetic surgery and anesthesia is unknown, and studies suggest the rate may vary considerably.\textsuperscript{20} One study showed a death rate of approximately 1 in 5,000 in patients undergoing liposuction,\textsuperscript{17} while other studies showed lower mortality rates of approximately 1 in 50,000 or less.\textsuperscript{42,44-46} The simultaneous performance of multiple cosmetic procedures increases the risk of complications.\textsuperscript{17,25,30}

**Risk Stratification and Prevention Measures for Venous Thromboembolism**

Because VTE seems to be the leading cause of mortality from cosmetic surgery procedures, there is much discussion about the appropriate use of preventive measures.\textsuperscript{12,14,16,17,31,42,43} Risk stratification includes identification of patient-related factors such as a history of VTE, hormone replacement therapy, obesity, use of oral contraceptives, advanced age, recent travel, pregnancy, immobility, smoking, cancer, hypercoagulable blood disorders, recent myocardial infarction, and low flow states such as congestive heart failure.\textsuperscript{12,14,16,31,43} Procedural risk factors include the use of general anesthesia, longer procedures, and combined procedures (especially when abdominoplasty is one of the procedures).\textsuperscript{12,14,31,43} A VTE prevention plan (Table 3) should be made in accordance with patient and procedural risk factors. Despite the known risks of VTE, fewer than half of cosmetic surgeons are believed to consistently use prophylaxis.\textsuperscript{13}

**Summary**

The rapid growth of office-based cosmetic surgery and anesthesia increases the likelihood of an individual nurse anesthetist’s involvement in this practice area. Because the special knowledge and skills inherent to this setting may not be presently taught in most anesthesia programs, it is up to the practitioner to become aware of the special
Low risk (healthy patients without known risk factors, surgery time \(< 1\) h if general anesthesia or \(< 2\) h if sedation\)\(^{12,14,16,28,31,43}\)

- Slight knee flexion during surgery
- Positioning to prevent external pressure on lower extremities
- Avoidance of tight garments
- Early ambulation

Moderate risk (1-4 risk factors, higher risk procedure such as abdominoplasty, surgery time \(> 1\) h if general anesthesia or \(> 2\) h if sedation\)\(^{12,31,42}\)

- Consider enoxaparin 30 mg/d subcutaneously starting 6-12 h postoperatively for 7-10 d.

Moderate risk (4 risk factors or multiple procedures including liposuction or abdominoplasty)

- Consider enoxaparin 40 mg/d subcutaneously starting 6-12 h postoperatively for 7-10 d.

High risk (> 4 risk factors or multiple procedures including liposuction or abdominoplasty)

- Consider enoxaparin 40 mg/d subcutaneously starting 6-12 h postoperatively for 7-10 d.

Table 3. Risk-Reduction Measures for Venous Thromboembolism\(^{12,14,16,28,31,43}\)

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<thead>
<tr>
<th>Risk Level</th>
<th>Measures</th>
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<tr>
<td>Low risk</td>
<td>Consider hematology consultation, use of sequential compression devices, use of compression stockings, alteration of OR bed position during surgery. Consider enoxaparin 30 mg/d subcutaneously starting 6-12 h postoperatively for 7-10 d.</td>
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