2018 Oregon Dental Conference®
Course Handout

Stuart Lieblich, DMD

Course 9174: “Coordinated Management of Office Anesthetic Urgencies: A Program for the Doctor and Staff”

Saturday, April 7
8 am - 4 pm
Coordinated Management of Office Anesthetic Urgencies

Stuart E. Lieblich, D.M.D.
Clinical Professor
University of CT
Private Practice, Avon CT
StuL@comcast.net

Thanks: OSOMS and ODA

Objectives
- Review the most common office anesthetic emergencies
- Discuss team management of office emergencies
- Review patient evaluation and monitoring for outpatient anesthetics
- Discuss actual cases and management

Anesthesia Complications in the Dental Office

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A Bad Day in the Office

A GREAT Day in the Office!

Low Frequency High Impact Events

What are the risks?

The risk of the sedation > risk of the procedure
The safety of sedation is not < risk of general anesthesia

We all know the problem
What are the risks

- Risks of Methohexital > Midazolam > Propofol

The Three R’s of Emergency Management

- Readiness
- Recognition
- Reaction

Preparation of Office and Staff

- Well organized staff
- Practiced emergency drills
  - Simulation (Sim-Man)
- Appropriate emergency equipment

Inadequate Training

- Causes of morbidity and mortality in anesthesia in OMFS are understood to be hypoventilation and hypoxygenation as the critical event
- RESPIRATORY, not CARDIAC
- Current widely used programs for patient rescue in the US focus on resuscitation of patients in cardiac arrest

WHY HUMAN SIMULATION COURSES??

- Anesthesia emergency response can be practiced without harm to patients when error occurs in:
  - Failure to appropriately respond
    - Current response requires knowledge that is diverse, complex and rarely used.
  - Teamwork
    - Appropriate response in a timely manner requires competent teamwork.
  - Need for rapid response
    - Practice can improve efficiency of the individual and the team and the office setup

I wanted to let you know that I just successfully treated asystole with respiratory arrest in the office. The patient was a 67 year old with a history of HTN. Presented for debridement of the left mandible secondary to BRONJ. Was lightly sedated and started down the tubes. Required CPR, LMA placement etc. Patient was transferred in stable condition to the ER about an hour ago for work up and diagnosis.

The reason for the email is to thank you. There is no doubt in my mind that my experiences with simulation with your teaching and influence contributed to the success of the management. My staff, I must admit, was perfect but that is thanks to their dedication and what we practice which again I learned mostly from you.

If the patient understood how much simulation contributed to today’s success she would be thanking you also.

Total In-Office Death/Brain Damage Cases Reported to OMSNIC

2000 - 2012

103

Incidence of In-Office Anesthesia Death & Brain Damage Cases

103 cases = 1

36,272,094 procedures 352,156

Frequency of Office Anesthetic Deaths 2000-2012

• 1 in every 528 OMS will experience an office anesthetic death per year

• In a 30 year practice life 1 in 18 OMS will experience an office anesthetic death

Additional Anesthesia Claims 2000-2012

• Inadequate anesthesia--20
• Phlebitis----------------19
• Falls-------------------13
• Nerve Injuries---------11
  Needle stick (9)
  Positioning (2)
• Inappropriate anesthesia--7

Additional Anesthesia Claims 2000-2012

• Deaths after taking post op pain meds at home--7
• Billing disputes--------6
• Stormy induction, restraint (Physical abuse)----5
• Ocular Injuries--------4
• Traumatic intubation----2
• Non Licensed administer--3

Additional Anesthesia Claims 2000-2012

• Slow emergence---------7
• Nausea & Vomiting------4
• Stroke--------------------3
• Pulmonary emboli--------2
• Hypertension------------2

Additional Anesthesia Claims 2000-2012

• Hypotension--------------1
• Laryngospasm-------------1
• Congestive Heart Failure--1
• Swelling from Ace Inhibitor-1
• Methadone withdrawal----1
• Flash fire-----------------1

Additional Anesthesia Claims 2000-2012

• Respiratory distress--18
• Seizures-----------------16
• Cardiac------------------16
• Paradoxical reaction--10
• Aspiration---------------7
• Allergic reaction-------7
• Tachycardia-------------6
Additional Anesthesia Claims 2000-2012

- Molestation ----------- 3
- IV Catheter fragment--- 2
- Burn from ventilator--- 1
- Broken needle----------- 1
- Reuse of I.V.------------- 1
- aborted Induction-- realized his notes were different-- 1

Additional Anesthesia Claims 2000-2012

- Claim anesthesia never should have been administered
- BP: 150/109, 20y/o diagnosed
- 6 months later with Phaeochromocytoma.
- Death after Local anesthesia--- 1
- Auto accident on way home (Loc) 1

Top Office Medical Emergencies in Dentistry

From: Stanley Malamed, D.D.S.

N=30,608

Office Emergencies

- #10 Cardiac arrest n=331
- #9 Insulin shock (hypoglycemia) n=890
- #8 Epinephrine reaction n=913
- #7 Hyperventilation n=1326
- #6 Asthmatic attack n=1392
- #5 Seizures n=1595

Office Emergencies

- #4 Postural hypotension n=2475
- #3 Angina pectoris n=2552
- #2 Mild allergic reaction n=2583
- #1 Syncope n=15407

Time of Occurrence of Systemic Complications

- 1.5% just before treatment
- 54.9% during/after local anesthesia
- 22.9% during treatment
- 15.2% after treatment
- 5.5% after leaving office

Emergency Drugs

Emergency Drugs
Smart Tray

Assignment of ASA Class

- ASA I: normal, healthy patient
- ASA II: mild systemic disease
- ASA III: significant systemic disease
- ASA IV: significant disease, constant threat to life
- ASA V: moribund patient
- ASA VI: organ donor patient

ASA Classification

- ASA I: Better not die
- ASA II: Shouldn’t die
- ASA III: Could die
- ASA IV: Probably will die
- ASA V: Practically dead

Anesthetic Management ASA I or ASA II

- Assess level of anxiety
  - Mild: local anesthesia +/- oral sedation
  - Moderate: nitrous oxide/oxygen +/- oral sedation or IV conscious sedation
  - Significant: IV deep sedation/GA

ASA III or ASA IV

- Detailed history
- System intensive physical exam
- Appropriate lab studies
- Consultation prn

ASA III or ASA IV

- Assess level of anxiety
  - Mild: local anesthesia +/- oral sedation; And/or nitrous oxide (indicated in some disease states)
  - Moderate: IV conscious sedation or IV deep sedation (in selected cases, dependend on stability and practitioner familiarity with disease state)
  - Significant: consider hospital setting

Case #1:

- JW: 62 year old for extraction of 6 carious teeth
- Anxious about his surgery and wants to be “asleep”
Medical History

• Past surgical history:
  – 2012 prostate surgery

• Past medical history:
  – High blood pressure
  – Diabetes
  – Allergy to Ceftin

Medications

• Glucophage (Metformin) 2000 mg
• Hyperglycemic agent
• Avandia (Rosiglitazone) 4 mg
• Hyperglycemic agent
• Lipitor (Atorvastin) 10 mg
• Hypercholesterolemia
• Zestril (Lisinopril) 20 mg
• ACE inhibitor

Preoperative Discussion:

• Medical history
• Changes in medications
• Frequency of medical visits
• Preoperative vital signs
  – At consultation visit
  • BP
  • Heart rate and rhythm
  • Auscultation

Preoperative Examination:

• Focused questions on health status:
  – Monitoring of blood sugar?
  – Incidence of chest pain?
  – Overall recent health?
  – Activity level?

Laboratory Tests

• Random Glucose
  – Consider at consult visit and day of surgery
• Query about recent labs
  • Hgb A1C
  • Electrolytes +/-
  • ECG report
  • Within 6 months of surgery

Risks of Hypertension

• Hypertension prevalence in surgical patient is about 20 – 25%.
• Hypertension is a major risk factor for cardiac, cerebral, renal and vascular disease.
• The presence of left ventricular hypertrophy (LVH) in hypertensive patients may be an important predictor of cardiac mortality.
• Cardiovascular complication account for 25 – 50% of death following noncardiac surgery

HOW CAN WE DETERMINE WHETHER A PATIENT HAS A HIGHER THAN AVERAGE RISK?

METs

• “Metabolic Equivalent”
• 3.5 mL O2/kg/min, or sitting and reading= 1 MET

Mangano et al. 1990
Assessment of reserve

Risks of anesthesia
- Decreased systemic vascular resistance
- Decreased stroke volume
- Induction of general anesthesia lowers systemic arterial pressures by 20-30%
- Tracheal intubation increases the blood pressure by 20-30 mm Hg
- And respiratory issues of course!

Jassal, D. Perioperative Cardiac Management. eMedicine. January,

Management of This Case
- Assume good glycemic control
- BP under control
- Cholesterol under control
- ASA status III
- Walks 2 miles a day (slowly)

Would You Treat in Your Office?
- A: no way
- B: yes, just local
- C: yes, local and nitrous oxide/LA
- D: yes, low dose sedation
- E: yes, sedation with propofol

Modification
Why is this patient different than an ASA I teenager?
- Be sure to reiterate to take all preop meds
- Verify blood sugar on day of surgery
- Nitrous oxide/oxygen prior to IV start
- "low and slow" titration
- Judicious fluids during case
- Cautious discharge

Malampatti Classification

Ideally preoperative vital signs should be obtained at a consultation appointment

Monitoring for Ambulatory Anesthesia
- Preoperative vital signs: Required
  - Heart rate
  - Heart rhythm
  - Blood pressure
- Preoperative vital signs: Case dependent
  - Respiratory rate
  - Temperature
  - Blood sugar

Monitors in OMFS
- Non-invasive
  - Automated blood pressure
  - Pulse oximetry
  - ECG
  - Capnography
- Visual monitoring
  - Respiration rate and depth
  - Skin color
Pulse Oximetry

- Standard for conscious sedation
- Indication with nitrous oxide
- Rapid and accurate
- Cost effective
- Audible alarms

Pulse Oximetry

- Movement sensitive
- Poor peripheral perfusion effects accuracy
- Not a direct measure of oxygenation
- Doesn’t measure ventilation
- “A sentinel standing at the cliff of desaturation”

Oxygen Dissociation Curve

End-tidal Carbon Dioxide Monitoring

- Capnometry
  - Shows numbers only
  - “A television without the picture tube”
- Capnography
  - Shows waveform as well

Mandatory Capnography

- AAOMS Statement April 3, 2012 BOT
- “During moderate or deep sedation and general anesthesia the adequacy of ventilation shall be evaluated by continual observation of qualitative clinical signs and monitoring for the presence of exhaled carbon dioxide unless precluded or invalidated by the nature of the patient, procedure or equipment.”

AAOMS BOT 4/3/12

- “Improvements in monitoring exhaled CO2 during anesthesia continue to evolve. Beginning in 2014, AAOMS Office Anesthesia Evaluations will require capnography for moderate sedation, deep sedation and general anesthesia unless precluded or invalidated by the nature of the patient, procedure, or equipment.”

End Tidal CO2 (ETCO2)

- Maximal concentration of CO2 at the end of respiration
- Normal = 5-6% CO2 (35-45 mmHg)

Capnography

- 3 phases
- Alpha angle
- Measure CO2 for cardiac output
Only 1 Normal Pattern

Capnography
• Height: depends on end tidal volume
• Frequency: depends on respiratory rate
• Rhythm: function of the ventilator or patient’s respiratory center
• Baseline: should return to 0

Detection of intubation problems
• Disconnect, esophageal intubation, kinked tube
• Ventilation problems
  – Obstructed airway, hypo/hyperventilation
• Circulation problem
• Drug problem

Deadspace
• Arterial to End tidal CO2 Gradient

CO2
• Production
  – Cellular metabolism
• Transportation
  – To lungs via the pulmonary capillaries
  – 90% carried via comb with water to form bicarb
• Elimination
  – PaCO2=45mmHG (venous blood in lung)
  – PACO2=40 mmHG (arterial conc)
Any Guesses?

Capnography
- Verifies intubation
- Ventilation
- Circuit
- Drugs

Conclusions: Capnography
- Hypoventilation/apnea precedes hypoxia
  - Capnography can recognize:
    - Airway obstruction
    - Hypoventilation
    - Apnea

Any Guesses?

Capnography
- Concomitant oxygen administration maintains SpO2 longer after apnea
- Therefore delay in pulse oximeter changes
Respiratory Emergencies

- Airway obstruction
- Laryngospasm
- Bronchospasm
- Emesis / Aspiration
- Hyperventilation
- Respiratory Depression/Arrest

Airway Obstruction

**SIGNS AND SYMPTOMS**
- Stridor, wheezing
- Use of accessory breathing muscles
- Decreased O2 saturation
- Cyanosis

It’s always the airway


Emergencies of the Respiratory System

- Foreign Bodies
- Teeth and tooth fragments
- Implant wrenches and cover screws
- Pieces of soft tissue or bone
- Gauze packs

Always be prepared to manage foreign body obstruction!!!

Case Presentation

- 56 year old male for extraction of 6 maxillary teeth
- ASA II (hypothyroid)
- Patient requests to be “asleep”

Case Presentation

- Anesthetic course
  - 5mg midazolam
  - 50 mcg fentanyl
  - 20 mg of propofol (for the injection)
  - 4 carpules lidocaine with epinephrine
Case Presentation

- Surgery was faster than expected (5-7min)
- Doctor left room to see other patients
- Patient became restless, agitated, spit out gauze
- Required repacking 3-4 times by assistant
- Continued to get more restless, agitated
- Became less arouseable
- Assistant interpreted as more relaxed, removed monitors

After patient became even more unresponsive, pulse ox reconnected
- Doctor called back into room
- Oxygen saturation 81%
- Gauze pack removed
- Saturation continued to drop
- Positive pressure oxygen attempted

Intubation attempted X 3
- 911 called
- Surgical airway “attempted”

Diagnosis?

- Post mortem: 2 X 2 gauze lodged in vocal cords
- Malpractice suit (wrongful death) against doctor, corporation and assistant
- Case dropped against assistant
- Jury verdict $1.2 million

How was patient monitored?
- Level of training of assistant
- Sedated and anesthetized patients should have monitors in place and be observed by a human until awake and alert
- Small gauze packs are inappropriate
  - Use an opened 4 X 4 with several inches protruding

Suggestions

- Airway access
  - Those working with impaired airways should be trained and equipped to perform a surgical airway

“Normal” Blood Pressure

- Need accurate baseline
- Adults: can vary 15-25%
- Neonates and infants:
  - Have fixed stroke volume
  - BP is primarily related to heart rate

Suggestions

- “Normal” Blood Pressure
  - $10,000
  - $40
Advantages of videolaryngoscopy
- Improves first attempt intubation
- Less stimulating... awake intubation?
- Traditional airway assessment for intubation becomes less relevant
  - Jaw size, mand position and mobility
  - Tongue size?
  - MIO
- Still need to assess BVM difficulty
  - Old age, facial hair, teeth, BMI, list of snoring, neck mobility

Caveats !!!
- Can't just buy it and be good
- May improve view, still may not be able to pass tube
- Blade can easily push tongue posteriorly if you do not know where to look.
  - Look at patient first, then screen
  - Pharyngeal injury possible if looking
- Must keep blade relatively still, cannot use to manipulate larynx into view
- Pharyngeal wall injury
- Equipment may fail !!!!
Hypertension: (Moderate) 160-200/95-110
- Recheck in 5 minutes
- Medical consultation
- Consider nitrous oxide and/or oral sedation
- Routine treatment with stress reduction

Hypertension: (Severe) >200/>110
- Recheck in 5 minutes
- Observe patient
- Immediate medical consultation
- No treatment except severe emergency with nitrous oxide to decrease BP

Intraoperative Hypertension
- Anxiety
- Inadequate anesthesia
- Especially local anesthesia failure
- Inadequate ventilation
- Iatrogenic drugs: epinephrine
- Preexisting medications: MAOI, missed dose of antihypertensives

Intraoperative Hypertension
- Bladder distension
- Hyperthyroid storm
- Malignant hyperthermia
- Alcohol withdrawal syndrome

Treatment of Hypertension
- Sedation, narcotics
- Additional local anesthesia
- Optimize ventilation
- Assess bladder volume

Treatment of Hypertension
- Labetalol
  - Nonselective Beta-blocker and some alpha effects
  - Decreases BP more with less increase in HR
  - 5-20 mg dose IV

When would I treat Hypertension?
- >25% increase MAP over baseline AND:
  - Severe unremitting headache
  - Visual changes
  - Focal neurologic deficit
  - ECG changes: new onset
    - ST elevation
    - T wave inversion
  - Basically almost never

Case Presentation
- 47 year old male patient for extraction #30 (surgical extraction)
  - Anesthetic plan:
    - Extraction with nitrous oxide/oxygen, local anesthesia
  - Day of surgery:
    - BP 210/122, pulse 90

Treat Patient Today?
Case Presentation (Cont’d)
• Surgery cancelled; referred to PCP
• Patient returns 6 weeks later
• Medication: Catepress (clonidine) .25 mg BID
• BP 105/62, pulse 88

Treat patient today?

Case Presentation (cont’d)
• Extraction with 60% nitrous oxide/Oxygen; 2 carpules lidocaine with epinephrine
• Procedure time 15 minutes
• Patient “abruptly” moved to recovery area
• Upon standing; patient fell
• Struck face against counter
– #8 and #9 fractured at gingival margin
– Subcondylar and parasymphseal fractures
– Through and through laceration of chin

Outcome
• Oral surgeon didn’t recognize the subcondylar fracture
• Sued for malpractice due to poor outcome of the fracture management, scar and dental injuries
• Doctor and corporation sued for failure to recover patient properly (diffusion hypoxia and unrecognized orthostatic hypotension)

Hypotension
• Much more worrisome than hypertension

Hypotension
• Three primary causes
– Inadequate venous return
– Decreased pump function
– Decreased vascular resistance

Inadequate Venous Return
• Hypovolemia
• Blood loss
• Clinical signs
  – Tachycardia
  – Dry mucus membranes
  – Decreased CVP or jugular venous height

Are Ambulatory OMFS Patients Hypovolemic?
• Study: Administration of fluids (D₅½ NS) to ambulatory OMFS pts vs. KVO
  (Bennett J, MacDonald T, Lieblich SE, Piecuch JP; 1998)
• Evaluate parameters
  – Time to discharge
  – Post operative dizziness, weakness
  – Post operative nausea/vomiting

Results
• Significant reduction: nausea and vomiting
• Patients reported sooner return to “normal” feeling
• Reduction in heart rate in perioperative period
• Cost of 500cc of D₅½ NS is $2.78
Hypotension: Inadequate venous return
- Fluid challenge
  - ? Administer routine fluids
- Supine position

Hypotension: Decreased cardiac function
- Reduce anesthetic gases
- Treat arrhythmias
- Treat ischemia
- Consider steroids (if history of chronic use)

Hypotension: Decreased vascular resistance
- Requires supportive medications
  - Ephedrine
    - 20 mg/100 mL
  - Epinephrine
    - If anaphylactic reaction suspected or if severe
    - 0.1 mL/kg IM

ECG for OMFS

“Across the Room” ECG Diagnosis
- Width of QRS
- Regularity of QRS
- Abnormal QRS
- P waves preceding QRS

Tachydysrhythmias
- Interferes with ventricular filling
- Decreased cardiac perfusion
  - Induces or worsens ischemia

Tachycardia
- Deepen anesthesia
- Check local anesthesia
- Volume deficit
- Drug induced:
  - Self limiting with methohexital (5-7 min)
  - Associated with isoflurane induction

When would I Treat Tachycardia?
- PSVT AND:
  - Hypotension
  - Chest pain
- Adenosine
Bradycardia

- Awake patients
  - Change in mental status
  - Light-headedness
  - Nausea
- Anesthetized patients
  - Fall in blood pressure
  - Treat more aggressively in children

Verify oxygenation

- Remove or block causes of increased vagal tone
  - Treat hypertension if its causing the reflex bradycardia
  - Traction on eye, arterial pressure on carotid
- Vagolytic drugs
  - Atropine
  - Ephedrine if bradycardia + hypotension

Arrhythmia: not requiring treatment

- Wandering atrial pacemaker

Sinus arrhythmia

- Cyclic variation with inspiration

Arrhythmias During Anesthesia

- Precipitated by catecholamines
- Often during induction
  - Resolve with deepening of the anesthesia
- Underlying causes must be corrected
  - Hypoxemia, hypercarbia
  - Electrolyte abnormalities

Ventricular Arrhythmias

- Increased risk with toxic digoxin level
- Increased risk with low K+
  - Hyperventilation will acutely decrease K+
- Tricyclic antidepressants increases incidence of tachydysrhythmias
  - Stop 72 hours before elective surgery

Case Presentation

- 22 year old female for extraction of impacted third molars
- ASA Class I
- Requests general anesthesia
- Anesthetic plan
  - Nitrous oxide/oxygen
  - Intravenous anesthesia

- Anesthetic plan
  - Nitrous oxide/oxygen
  - Intravenous anesthesia
Anesthetic Course

- 50% O₂/nitrous oxide
- Upon starting the IV the patient becomes pale, diaphoretic and unconscious
- Patient has a 15-30 second seizure
- Remains obtunded and unarouseable
  - Heart rate = 40
  - ? Cause/management

ECG Lead II

Treatment of Heart Block

- Mobitz Type I or II
- Degree of cardiovascular compromise
- Bradyarrhythmia treatment

Outcome

- Doctor started IV
- Administered IV fluids (rapidly)
- Patient remained unconscious with slow heart rate
- Administered 0.4mg atropine X 2
- Rate increased to 72 (regular) with increased consciousness
- Proceed with case?

Case Presentation

- Case cancelled
- Vagal tone can persist for 24-48 hours
  - May not compensate with increased heart rate
- Patient rescheduled:
  - pretreatment with oral sedation at home (triazolam 0.25mg)

Ischemia and Infarction During Anesthesia

- Diagnosis
  - Pain: only immediately preop or in PACU
  - ECG changes
    - ST depression > 1mm
    - T wave inversion
    - ST elevation: injury pattern, prolonged ischemia

Ischemia During Anesthesia

- Need baseline ECG and baseline OR ECG
- Monitor Lead II for rhythm changes
- Monitor V₅ for ischemic changes
  - 75% sensitivity vs. 33% for Lead II
- V₅ move LA lead to V₅ and set for Lead I

Treatment of Intraanesthetic Cardiac Ischemia

- Increase oxygen concentration
  - Consider transfusion if anemic
- Maintain blood pressure
  - Keep MAP >80
  - Phenylephrine 100 μg boluses

- Nitroglycerin
- Decrease heart rate
  - Control with beta-blockers
  - Maintain BP since NTG and beta-blockers will tend to decrease BP
- Correct arrhythmias
  - Stop isoflurane (Forane mediated cardiac steal)
Cardiac Risk Factor: Previous Myocardial Infarction

- MI without previous history
  - <0.1%
- Incidence of reinfarction
  - First 3 months: 5.7% (36%)
  - 3-6 months: 2.3% (15.25%)
  - After 6 months: 1.9% (55%)
- Data: 1983 study (1977)
- Recurrent MI’s are usually “silent”
- Second peak: 48 hours post GA
- Mortality: 33.75%

Cardiac Risks with Non-cardiac Surgery

- Less than 4 MET’s
- Presence of Q waves on ECG
- Stress test shows areas of ischemic cardiac tissue at risk
- Revascularization reduces risk??
  - Not clinically proven
- HF risk > Aflib > CAD

Cardiac Stents

- Bare metal
  - Can stop antiplatelet therapy 4-6 weeks
- Drug eluting
  - 3-6 months of dual anti-platelet therapy
  - Risks with acute cessation

Look at the entire picture

Post course questions

1. Restless and agitation following administration of propofol is indicative of?
   - A: allergy
   - B: hypoxia
   - C: hypotension
   - D: syncope

If a triple airway maneuver is unsuccessful at improving oxygenation the next step is:

- A: Intubation
- B: Cricothyroidotomy
- C: Bag valve mask
- D: Succinycholine

The earliest signs of apnea (not breathing) after administration of midazolam is detected by:

- A: precordial stethoscope
- B: the ECG
- C: decreased blood pressure
- D: Pulse oximeter

If a patient has a MET level of 6 their risk of an office anesthetic is:

- A: Great and should not receive sedation
- B: Moderate and only local anesthesia should be given
- C: Slight increase but can be sedated if normal vital signs
- D: Treat as any other patient
A patient is noted not to have any end tidal CO2 on the monitor but the SpO2 is 97% one should:

• A: Call 911
• B: Place an oral pharyngeal airway
• C: Reverse the fentanyl
• D: Do a head tilt chin thrust maneuver

Answers

• 1 = B
• 2 = C
• 3 = A
• 4 = C
• 5 = D