Why You Should Pay Attention During M & M

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University of Michigan
Patient NB; Feb. 2016

- 49M
- ASA 3
- b/l groin hidradenitis suppurativa
- Presenting for b/l groin excisions
  - 1h30m
Past Medical History

- Recurrent groin abscesses x16 years
  - Multiple courses of PO antibiotics
- Obesity
  - 70”, 111 kg – BMI 34
- Low functional capacity
  - DOE w/1 FOS
- OSA
  - Prescribed CPAP but not using
Past Medical History

- DM2
  - Hgb A1c 9.2, poor adherence to 112 unit insulin/day regimen, preop clinic Glc 530
- h/o DVT
  - Provoked after leg fx; IVC filter in place
Past Medical History

- **Schizoaffective disorder**
  - Managed well w/medications
  - s/p multiple ECT, last 2-3 years prior
- **Stroke**
  - Listed in EMR—patient denies
- **HLD**
- **Gout**
Past Surgical History

• TKA
• Appendectomy
• L tibia external fixation
• L tibia hardware removal
• ECT (multiple)

• All at OSH
Social History

- Current smoker
  - 60 pack-years
  - 2 packs/day x 30 years
Anesthesia History

- OSH L tibia hardware removal
  - 2/2015
Anesthesia History

- OSH L tibia hardware removal
  - 2/2015
Anesthesia History

• 4 puffs albuterol x2 during case
Anesthesia History

general anesthetic. This is a common procedure and is usually accomplished easily using a specially designed flashlight called a laryngoscope. Due to the anatomy of your oropharynx and larynx, this method was unsuccessful. A special device with a camera called a Glidescope and its rigid stylet was used with success and a grade-3 view. This was achieved without any complications.
Anesthesia History

- OSH TKA 6/2015
  - Easy size #5 LMA
  - Uneventful
Allergies

- NKDA
Medications

- Allopurinol
- Aspirin
- Doxycycline
- Escitalopram
- FeSO₄
- Gemfibrozil
- Glimepiride
- Insulin lispro
  - 8 units BID
- Insulin glargine
  - 48 units BID

- Lisinopril
- Niacin
- Risperidone
- TMP-SMX
Medications

- Allopurinol
- Aspirin
- Doxycycline
- Escitalopram
- FeSO₄
- Gemfibrozil
- Glimepiride
- Insulin lispro – 8 units BID
- Insulin glargine – 48 units BID
- Lisinopril
- Niacin
- Risperidone
- TMP-SMX
Data

- ECG 1/2016: NSR
- CBC 1/2016: Hct 34.4
- BMP 1/2016: Na 131, K 5.5, Glc 530
Plan

- Spinal if patient amenable
  - Avoid airway
  - Operative site (groin) well-suited
  - Planned as outpatient case
  - Smoker
  - Prior DVT
  - Poorly controlled DM2
  - ?Undiagnosed CAD (DM2, DOE)
Plan

• Otherwise, AFOI
• Call for patient early in case AFOI required
• Cefazolin, SQH ordered by surgery
• Preop POC Glc, APAP, gabapentin
• Supine
Neuraxial anesthesia in known difficult airway

“Use of regional anesthesia in a patient with a recognized difficult airway does not solve the problem of the difficult airway; it is still there.”

-Jon L. Benumof MD

Failed neuraxial technique

- Difficult anatomy
- Patient tolerance
- Skill/experience/luck of anesthesiologist

Khetarpal et al., 2016.
High/total spinal

- Cardiorespiratory collapse requiring emergent intubation
LAST

- Cardiorespiratory collapse requiring emergent intubation
Prolonged/modified surgery

- Spinal wears off without CSE
- Procedure takes longer than planned
- Unexpected need for broader coverage
Perioperative complication

- Oversedation
- Blood loss
- MI
- Aspiration
- Bronchospasm
- Laryngospasm
- Anaphylaxis
- Seizure
- Transfusion reaction
Evidence: Multicenter RCTs
Evidence: Case reports

• 26F w/fetal bradycardia – urgent C-S
  – No airway hx, prominent, loose incisors, overbite, high arched palate, Mal IV
  – Spinal
  – Ureteral injury requiring urology
  – Spinal wearing off → decision for GA

Evidence: Case reports

- 26F w/fetal bradycardia – urgent C-S
  - RSI $\rightarrow$ G4V
  - Failed multiple DL attempts
  - Successful LMA

Saxena, 2013.
Evidence: Case reports

- 82M w/hip fx – hemiarthroplasty
  - Tracheal stenosis
    - Narrowest segment <7 mm diameter
  - Edentulous; airway exam otherwise wnl
  - Decision for spinal

Saxena, 2013.
Evidence: Case reports

- 82M w/hip fx – hemiarthroplasty
  - Implanted prosthesis breaks 2 hrs in
  - Spinal wearing off → decision for GA
  - Inhalational induction
    - Plan to maintain spontaneous ventilation
    - Avoid dynamic loss of tracheal tone

Saxena, 2013.
Evidence: Case reports

- 82M w/hip fx – hemiarthroplasty
  - LMA inserted $\rightarrow$ significant leak
  - Decision for AFOI $\rightarrow$ scope passed beyond stenosis & 5-0 ETT over scope
  - Deep extubation after spontaneous breathing returned
  - Authors: would CSE have been better?

Saxena, 2013.
Evidence: Case series

- Ankylosing spondylitis (AS)
  - Chronic, progressive inflammatory disease affecting spinal articulations
  - Difficult intubation: cervical osteophytosis (decreased neck extension); possible TMJ disease
  - Difficult neuraxial: rigidly fused spine (decreased mobility)

Evidence: Case series

- Ankylosing spondylitis (AS)
  - 10-year retrospective single-center review of AS patients with perineal or lower limb surgeries

Schelew, Vaghadia et al., 1996.
GA vs Neuraxial in AS

### TABLE I  Patient demographic data

<table>
<thead>
<tr>
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<tbody>
<tr>
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### TABLE II  Spinal success vs failure

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Schelew, Vaghadia et al., 1996.
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GA vs Neuraxial in AS

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<th>Airway management</th>
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<tr>
<td>Intubation after GA induction</td>
<td>35</td>
<td>94.3</td>
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<td>Awake fibreoptic bronchoscopic intubation</td>
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<tr>
<td>Intubation by awake direct laryngoscopy</td>
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<tr>
<td>Facemask</td>
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<td>100</td>
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Schelew, Vaghadia et al., 1996.
Patient NB (Part 2)

- Preop (day of surgery)
  - 3rd case start
  - OK with spinal...but only if attending does
Physical Exam

- Unremarkable
- T36.4
- BP 127/79
- HR 94
- RR 15
- SpO₂ 99% RA
Airway Exam

- Mallampati III
- Thick, obese neck
- Beard
Patient NB (Part 2)

- Preop (day of surgery)
  - 18g PIV placed by preop RN
  - POC glucose 156
  - 1225: administered glycopyrrolate 0.25 mg (in case spinal fails & AFOI required)
Patient NB (Part 2)

- 1245
  - Patient in room (OR 13)
  - BP 134/90
  - HR 110
  - Airway cart outside door
Patient NB (Part 2)

- 1249
  - Midazolam 2 mg IV
- 1253
  - Uneventful spinal by attending
  - Bupivacaine 0.75% 1 mL
Patient NB (Part 2)

- 1257
  - T10 level obtained
  - Propofol gtt started @70
  - BP 105/59
Patient NB (Part 2)

- 1258
  - Heparin 5000 units SQ
- 1259
  - Cefazolin 2 g IV
  - 400 mL LR in
Patient NB (Part 2)
Patient NB (Part 2)

- 1303
  - Patient complains of generalized pruritis and “a little” trouble breathing
  - Erythema noted on upper chest & shoulders
  - Diphenhydramine 12.5 mg SQ
Patient NB (Part 2)

- 1305
  - BP 83/41, HR 134
  - Increased SOB, worsened pruritis
  - Worsened erythema & urticaria noted
  - Propofol gtt stopped
  - Phenylephrine 100 mcg IV
    - While drawing up epinephrine
Patient NB (Part 2)
Patient NB (Part 2)

- 1307
  - BP 60/32, HR 133
  - Patient unresponsive, apneic, markedly cyanotic
  - Periorbital & glossal edema noted
  - Staff STAT called
  - Airway cart brought into room from outside door
Patient NB (Part 2)
Patient NB (Part 2)

- **Anaphylaxis vs. high spinal**
  - Double hit on SVR
- **Trigger**
  - Cefazolin (most likely)
  - Latex (spinal gloves)
  - Chlorhexidine
# Anaphylaxis

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
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<th>Fri</th>
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<td>8 APS Keyword: Sciotic and Popliteal</td>
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<td>8 APS Keyword: AXillary and subclavian</td>
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<td>8 APS Keyword: Interscalene</td>
<td>11 CA-2: Critical Care Medicine</td>
<td>10:00 CA-1: Regional Anesthesia</td>
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<td>10:00 CA-1: Anesthesia Machines</td>
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<td>11 CA-2: Pediatric Anesthesia</td>
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<td>6:45 Visiting Professor - Does</td>
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Anaphylaxis
### Anaphylaxis

<table>
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<tr>
<th>Date</th>
<th>Event Description</th>
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<tr>
<td>Feb 1</td>
<td>M&amp;M Conference: Case 1: A Case of Desaturation - Drs. Rashad Abeerut/Raj Rao, Case 2: &quot;Case #2&quot; - Drs. Sean Ewing/Michael Mathis</td>
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<tr>
<td></td>
<td><strong>When</strong> Thu, February 4, 6:45am - 7:45am</td>
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<td></td>
<td><strong>Where</strong> Med Sci I M333</td>
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<tr>
<td></td>
<td><strong>Who</strong> Dr. Rashad Abeerut, Dr. Sean Ewing, Dr. Michael Mathis, Dr. Rajashankar Rao</td>
</tr>
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<td><strong>Docs</strong> M&amp;M 02-04-16 (67)</td>
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<td><strong>Evaluate</strong> Click here for CME credit. (142)</td>
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**Keywords:** Anaphylaxis, Desaturation, M&M Conference, Case 1, Case 2.
Pathophysiology

- IgE-mediated mast cell & basophil degranulation
  - Type 1 (immediate) hypersensitivity reaction – *allergic*
  - Preformed mediators released
  - Tryptase increases
Pathophysiology

- Anaphylactoid reaction
  - Direct action on mast cells & basophils
  - Non-IgE-mediated mast cell & basophil degranulation – non-allergic
  - Tryptase increase?
    - Yes in retrospective data
    - No in vancomycin bolus study


Renz CL, Laroche D, Thurn JD. Tryptase levels are not increased during vancomycin-induced anaphylactoid reactions. Anesthesiology 89(9): 620-25, 1998.
Differential diagnosis of elevated tryptase

- Anaphylaxis
- Systemic mastocytosis
- Severe renal failure
- AML

- Hypereosinophilic syndrome
- Myelodysplastic syndromes
- Onchocerciasis s/p ivermectin

Schwartz LB. Laboratory tests to support the clinical diagnosis of anaphylaxis. In: UpToDate, Post, TW (ed), UpToDate, Waltham, MA, 2016
Triggering agents

- Neuromuscular blockers
  - Most common
  - Cross-reactivity among classes
  - Sensitization from domestic substances

Sugammadex?


Triggering agents

- Latex
  - 2nd most common
  - Healthcare workers
  - Pediatric surgeries (spina bifida, genitourinary abnormalities)

Nel and Eren, 2011
Triggering agents

- **Antibiotics**
  - Usually penicillins, cephalosporins

- **Local anesthetics**
  - Usually esters
  - Occasionally: parabens in amides
Triggering agents

- **Protamine**
  - Prior vasectomy
  - Fish allergy
  - NPH insulin

- **Opioids**
  - Usually just expected side effects
  - True allergy rare
Triggering agents

- Chlorhexidine
  - Like NMBAs, can become sensitized from household products (e.g., mouthwash)
Signs & Symptoms

- Hypotension
- Arrhythmia
- Angioedema
- Urticaria
- Pruritis
- Bronchoconstriction/Dyspnea
- Abdominal cramping; N/V
Management

- Call for help
- Stop allergen triggers
- Epinephrine
  - ~50 mcg IV or ~300-500 mcg IM
  - Titrate to effect
- Albuterol (treat bronchospasm)
Management

- Central access/IV access as needed
- Arterial line as needed
- $H_1$ blocker, $H_2$ blocker
  - Recrudescence
- Corticosteroids
  - Recrudescence
- Draw serum tryptase
Patient NB (Part 3)

- 1308-1314
  - SpO₂ nadir 50%
  - Cuff pressure unobtainable
  - Bradycardia to 52
Patient NB (Part 3)
Patient NB (Part 3)

- 1308-1314
  - After some difficulty, successful ventilation established on 100% O₂ with bag mask
  - Lungs CTAB
Patient NB (Part 3)

- 1308-1314
  - Phenylephrine 100 mcg IV
  - Epinephrine 70 mcg IV
  - Vasopressin 1 unit IV
Patient NB (Part 3)

- 1314
  - Normoxia reestablished
  - BP 146/97, HR 107
  - Patient began spontaneous respirations
Patient NB (Part 3)

- 1314
  - ENT to room, performed nasal flexible laryngoscopy
    - Mild edema of arytenoids, no diffuse edema
    - Mobile vocal folds
    - Patent airway
  - Intubation deferred
Patient NB (Part 3)

- 1321
  - Epinephrine 30 mcg IV for recurrent hypotension

- 1322
  - Hydrocortisone 100 mg IV
  - 1 L total LR in
Patient NB (Part 3)

• 1327
  – Patient awakened; conversant
  – Albuterol 2 puffs INH

• 1331
  – Racemic epinephrine INH NEB

• 1332
  – Famotidine 20 mg IV
Patient NB (Part 3)

- 1336
  - Dexamethasone 6 mg IV
- 1343
  - Diphenhydramine 12.5 mg IV
  - Serum tryptase drawn
Patient NB (Part 3)

• 1353
  – Case aborted
  – Patient transported to PACU along with airway cart
  – Postop VS
    • BP 109/72
    • HR 106
    • SpO₂ 98%
Patient NB (Part 3)
Postoperative management

- Stable in PACU; slightly muffled voice & mild glossal edema
- Admitted to SICU for observation
- Started high-dose steroids
  - Hyperglycemia requiring insulin gtt, endocrinology consult
- Follow-up tryptase level x2
Postoperative management

• Transferred to floor on POD #1
• Discharged to home on POD #2
• Referral to allergy placed
Tryptase levels

• Ideally sent 1-3 hours after event
  – $T_{1/2} \approx 2$ hrs
• Additional sample at least 24 hrs after resolution (if no baseline available)
• Normal: 3-5 mcg/L (ULN 11.4)
Tryptase levels

- **Patient NB**
  - 40 min post-anaphylaxis: 53.6
  - 6 hrs: 23.2
  - 28 hrs (baseline): 7.7

Schwartz LB, 2016
Follow-up

- Surgery rescheduled for 5/2016
  - Uneventful; spinal anesthetic
Follow-up

- Surgery rescheduled for 5/2016
  - Uneventful; spinal anesthetic
  - No antibiotics administered
Follow-up

• Surgery rescheduled for 5/2016
  – Uneventful; spinal anesthetic
  – No antibiotics administered

• Never made allergy appointment
  – Recommended 6 weeks after episode
  – Most useful: latex, beta-lactams, NMBs
Observations/Discussion

- We were very fortunate airway was not compromised
- Prepared for unlikely possibilities (e.g., anaphylaxis) with glycopyrrolate & airway cart
  - Was this sufficient?
- CSE would not have helped
Thanks!

- Dr. Schopflin
- Dr. Healy
- Dr. Ewing
- Dr. Swiss
- Dr. Penn
References

- Renz CL, Laroche D, Thurn JD. Tryptase levels are not increased during vancomycin-induced anaphylactoid reactions. Anesthesiology 89(9): 620-25, 1998.
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