

# **Avoiding Disaster in Thyroid Surgery: 5 Critical Principles**

**David J. Terris, M.D.<sup>1</sup>**

**William S. Duke, M.D.<sup>2</sup>**

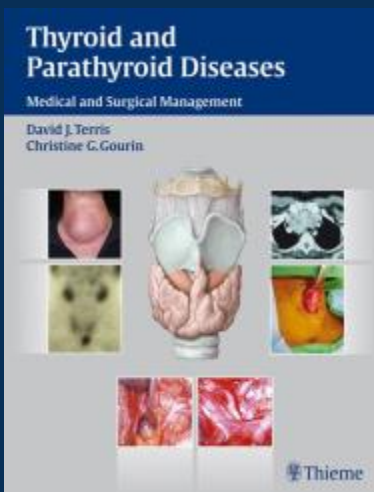
**Department of Otolaryngology-Head &  
Neck Surgery**

**<sup>1</sup>Augusta University**

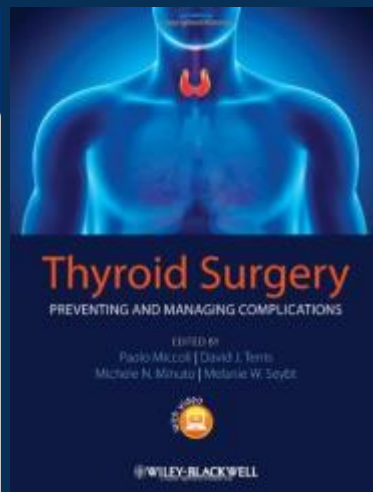
**<sup>2</sup>MultiCare Health System**

# Disclosures

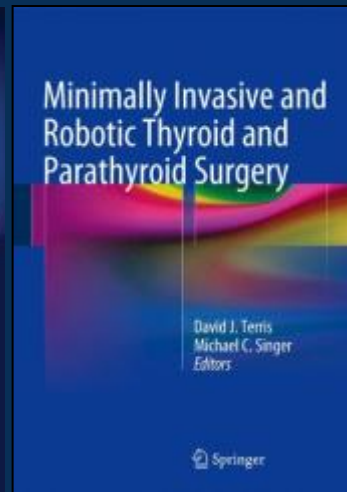
- No dualities of interest
- Royalties from endocrine books



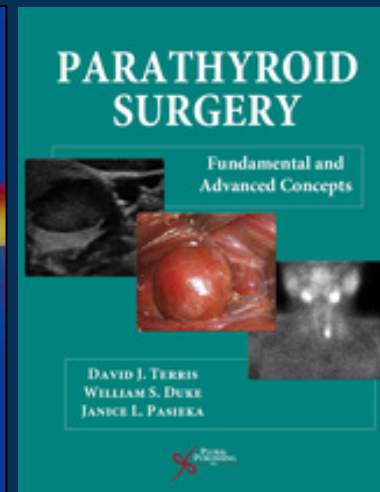
2009



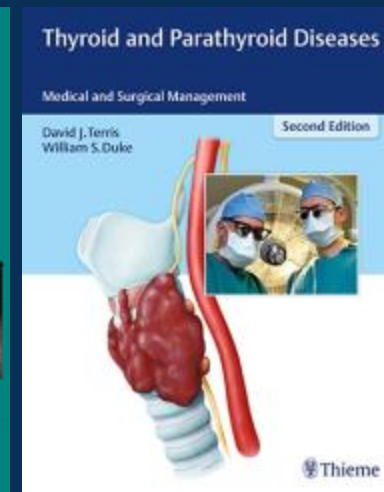
2012



2013



2014



2016

# Objectives

- Define disaster
- Strategies for avoiding catastrophe
  - Preoperative
  - Intraoperative
  - Postoperative
- 5 take-home pearls

# Top 5 Thyroid Disasters

1. Airway obstruction
2. Vascular injury
3. Metabolic crisis
4. Visceral injury
5. Permanent hypocalcemia

# **Less Disastrous (but still bad)**

**6. RLN injury**

**7. Poor cosmetic outcome**

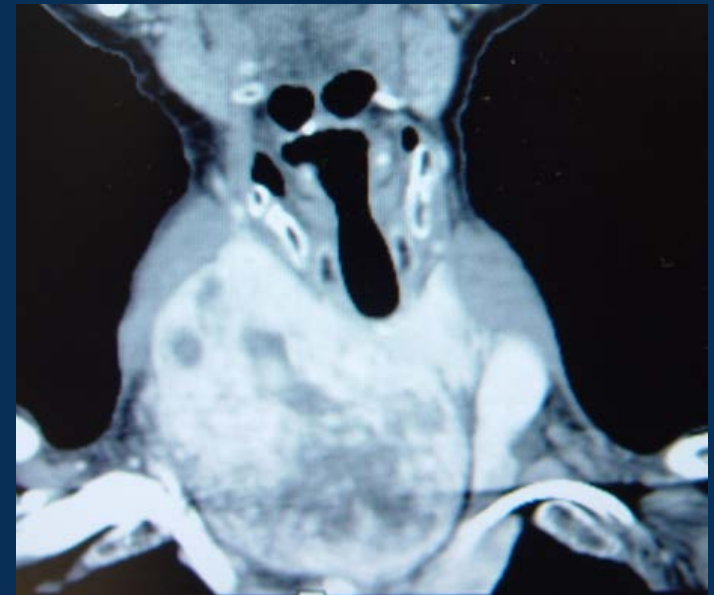
**8. Retained thyroid tissue**

**9. Wound complications**

**10. Anesthesia complications**

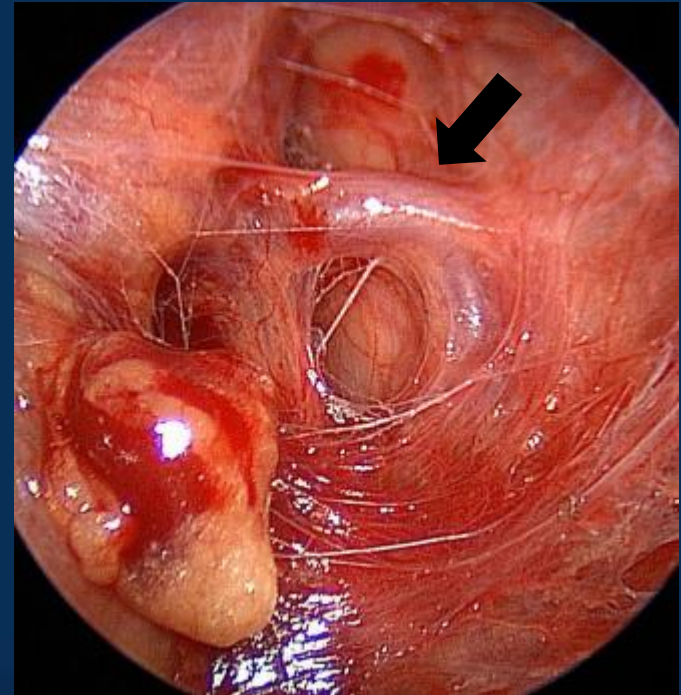
# #1: Airway Obstruction

- **Difficult intubation**
- **Bilateral RLN injury**
- **Expanding hematoma**



## #2: Vascular Injury

- Carotid artery / Jugular vein
- Innominate artery / vein
- Inferior thyroid artery



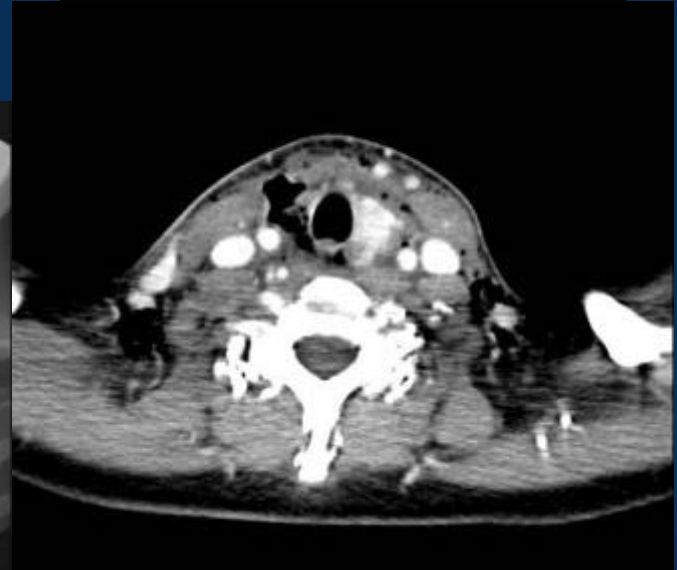
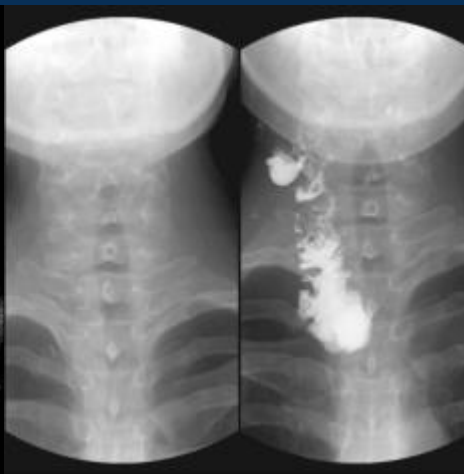
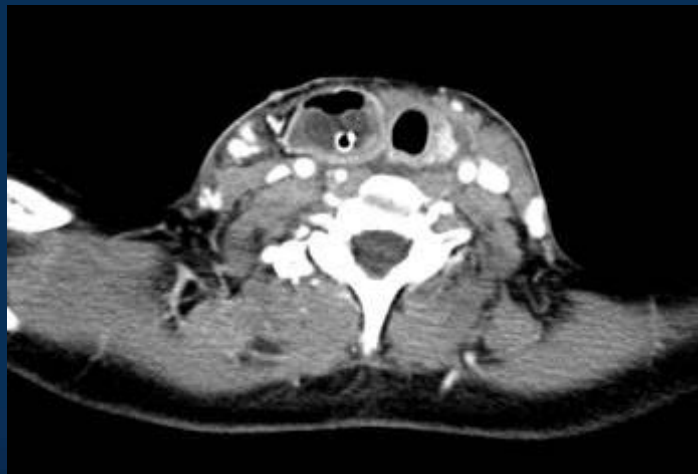
# #3: Metabolic Crisis

- **Thyroid storm**
- **MEN: Pheochromocytoma**
- **Multisystem organ failure**
- **Death**



# #4: Visceral Injury

- Tracheal injury
- Esophageal perforation
- Pleural violation



# #5: Permanent Hypocalcemia

- **Not life-threatening**
- **Very painful (for both patient and surgeon)**

## #6: RLN Injury

- **Inconvenient**
- **#1 cause thyroidectomy-related malpractice lawsuits**

# #7: Poor Cosmetic Outcome

- **Unsightly scar**
- **Conspicuous location**
- **Young female population**
- **Driving force for remote access thyroidectomy**



# #8: Retained Thyroid Tissue

- **Most common sites**
  - Superior pole
  - Pyramidal lobe
  - Ligament of Berry
- **Benign goitrous regrowth**
- **Problematic in cancer cases**
  - Thyroglobulin
  - Uptake scans

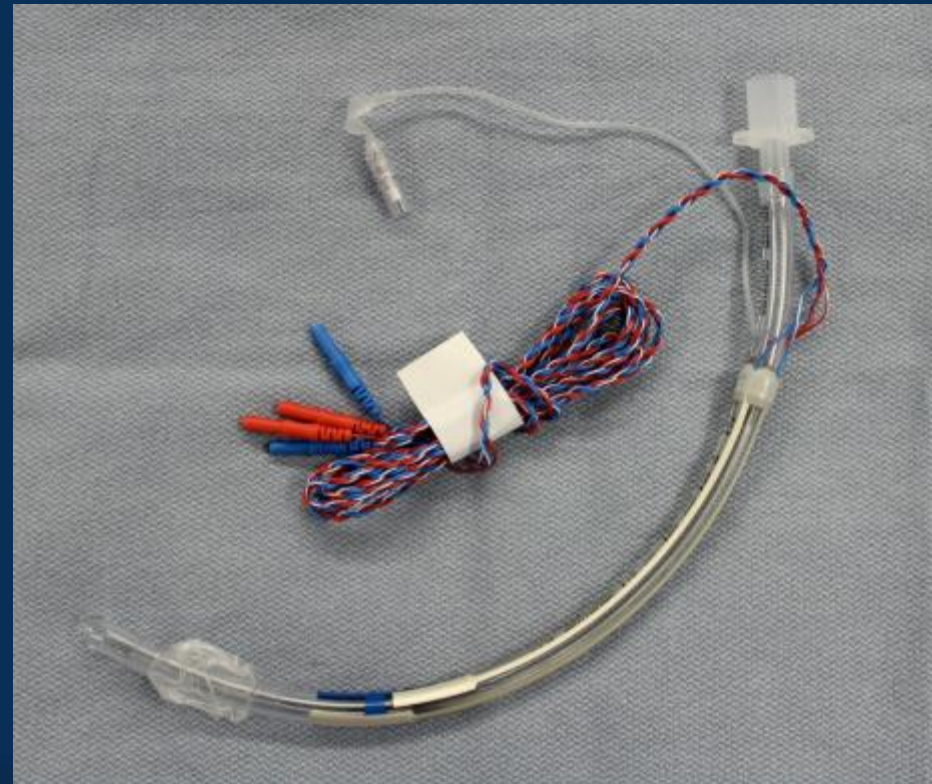


# #9: Wound Complications

- Infection
- Suture abscess
- Seroma

# #10: Anesthetic Complications

- Nausea / Vomiting
- Hoarseness



# Avoidance Strategies

- **Initial assessment**
  - Identify at-risk patients
- **Preoperative planning**
- **Intraoperative techniques**
- **Postoperative management**



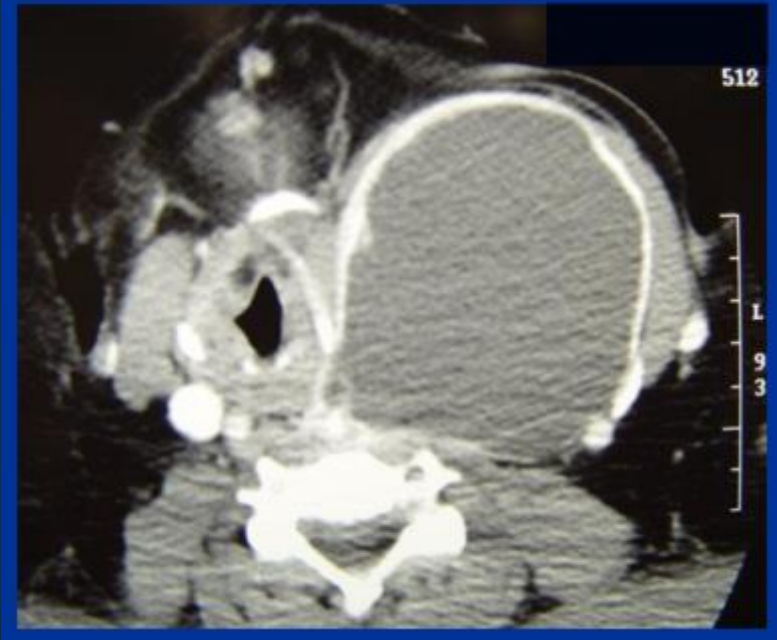
# Initial Assessment

- Large goiters
- Advanced cancers
- Hyperthyroid / Graves
- Unusual hypertension
- Prior surgery



# Preoperative Planning

- Laryngoscopy
- Ultrasound
- Cross-sectional imaging
- Proper medical management
  - Blood thinners



# Intraoperative Strategies

# #1 Airway Obstruction

- **Intubation**

- **Preoperative recognition (BMI, etc)**



# #1 Airway Obstruction

- **Intubation**

- **Preoperative recognition (BMI, etc)**
- **Glidescope, awake fiberoptic (rare in 2018)**



# #1 Airway Obstruction

- **Intubation**

- Preoperative recognition (BMI, etc)
- Glidescope, awake fiberoptic (rare in 2018)

- **Bilateral nerve injury**

- Stimulate side A before dissection side B

# Loss of Signal on Side A

- **Abort/stage**
- **Easier if a preoperative discussion held**
- **Mandatory in some countries**
- **What if it was *cut* and the other side “needs” to be done?**
- **Consider subtotal resection if you are a high-volume surgeon (leaving 0.5-1g at ligament)**
- **Otherwise, consider referring to another surgeon**

# Hybrid Nerve Monitoring





# Vagal stimulation

- Most recent significant change to my practice (Chiang, Randolph, others)
- Maybe not continuously . . .

ORIGINAL SCIENTIFIC REPORT

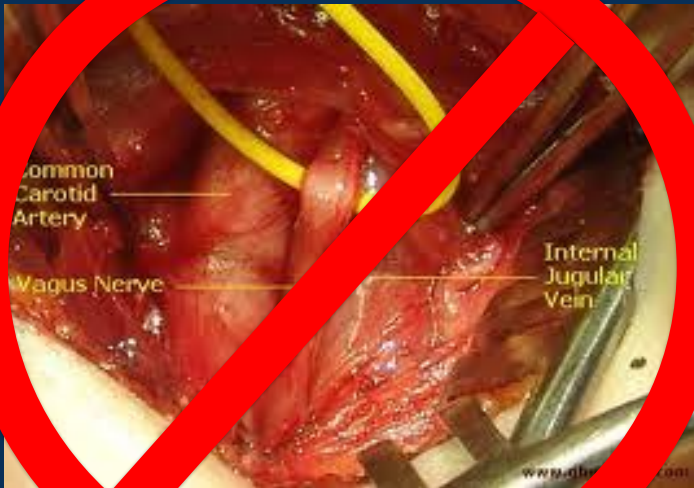
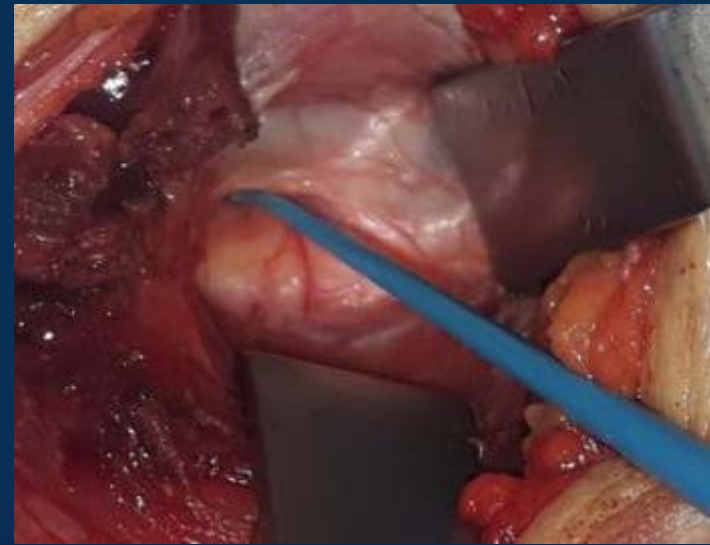
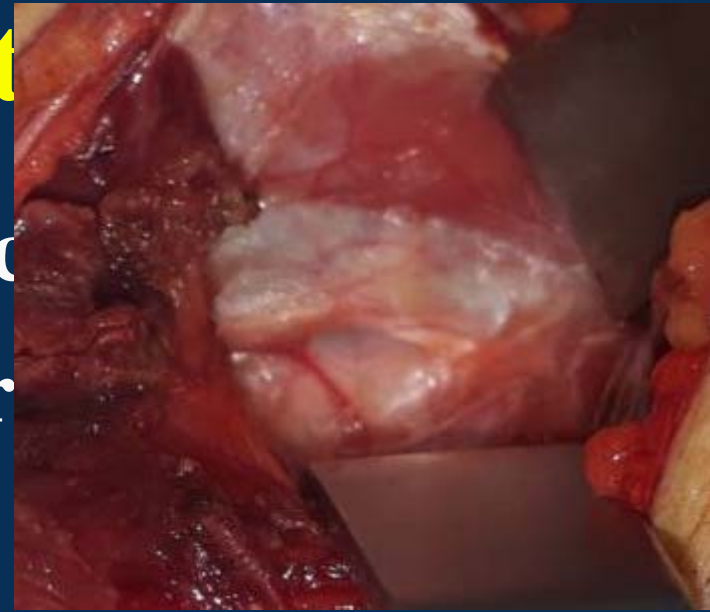
## **Continuous Vagal Nerve Monitoring is Dangerous and Should not Routinely be Done During Thyroid Surgery**

David J. Terris<sup>1</sup> · Katrina Chaung<sup>1</sup> · William S. Duke<sup>1</sup>



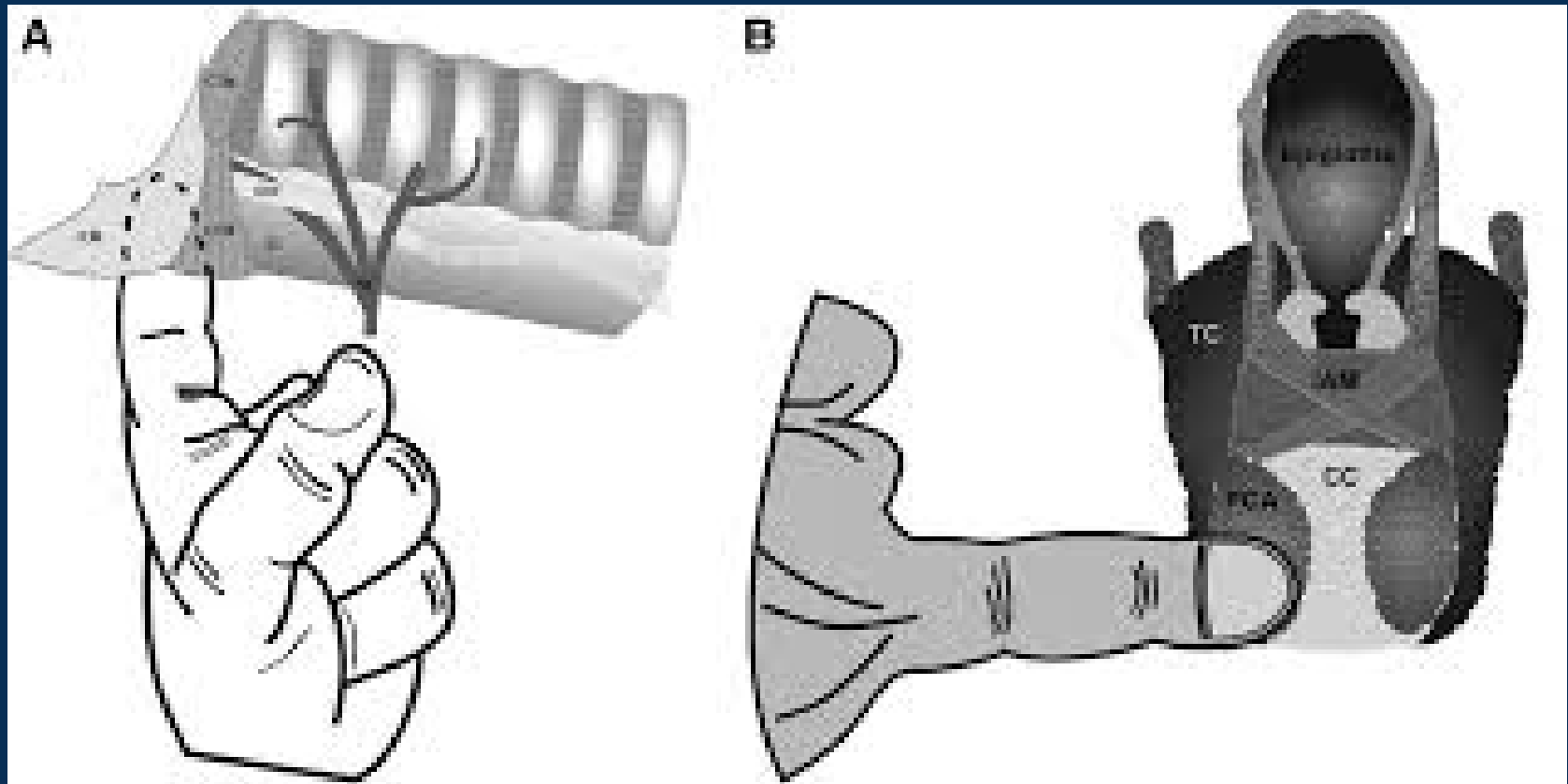
# Vagal stimulation

- Fast and useful in some circumstances
- Particularly helpful for paroxysmal supraventricular tachycardia



3 mA

# Laryngeal twitch



# Laryngeal twitch

- Also a good technique in absence of nerve monitoring
- Bilateral nerve paralysis should be near-never event



# #1 Airway Obstruction

- **Intubation**
  - Preoperative recognition (BMI, etc)
  - Glidescope, awake fiberoptic (rare in 2017)
- **Bilateral nerve injury**
  - Stimulate side A before dissection side B
- **Expanding hematoma**
  - No strap muscle closure

# Guard against expanding hematoma

- No closure of strap muscles



# No Strap Muscle Closure



- **Subcutaneous**
- **No compartment syndrome**
- **No airway compromise**
- **Resorbs promptly**

# Venous/Lymphatic Obstruction

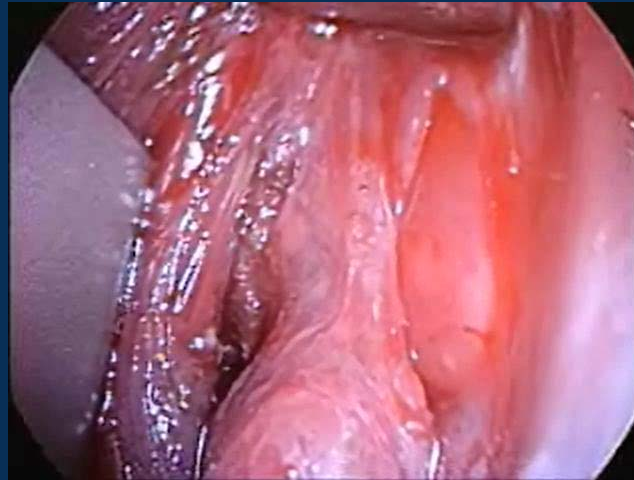
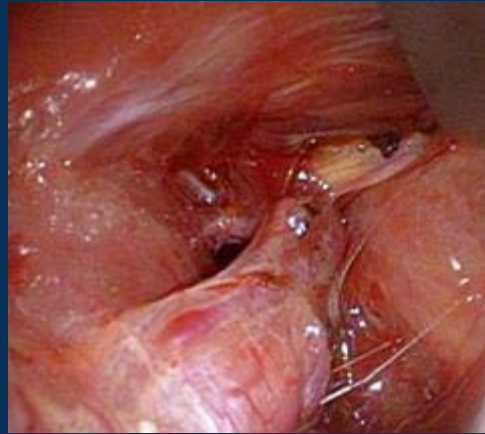




# #1 Airway Obstruction

- **Intubation**
  - Preoperative recognition (BMI, etc)
  - Glidescope, awake fiberoptic (rare in 2017)
- **Bilateral nerve injury**
  - Stimulate side A before dissection side B
- **Expanding hematoma**
  - No strap muscle closure
  - Deep extubation
  - Bundle ligation superior pole (adv energy)

# Bundle Ligation Superior Pole





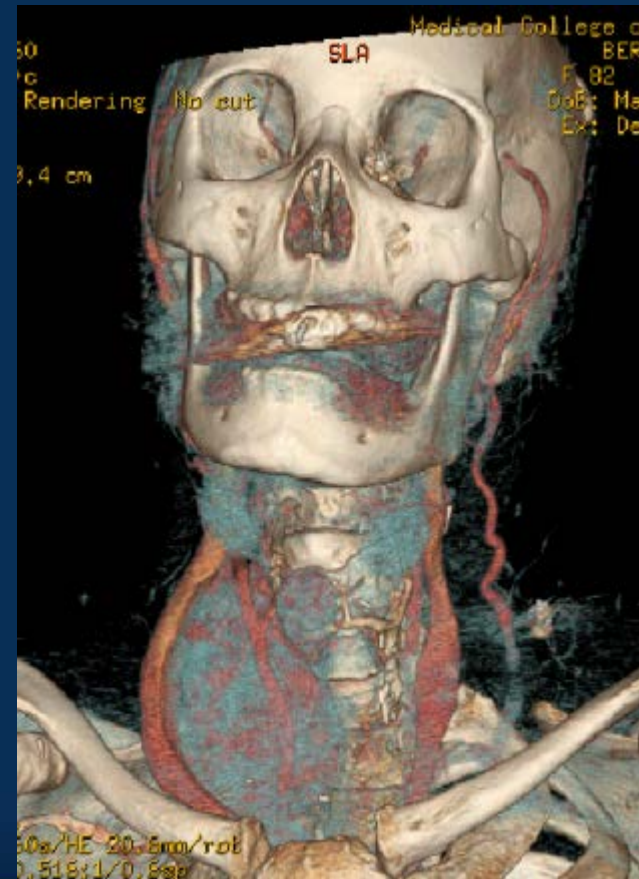
# Advanced Energy



Alternatives to stitches and clips

# #2 Vascular Injury

- Usually anomalous anatomy
- Palpate sternal notch (for high-riding innominate)
- Care with carotid sheath contents



# #2 Vascular Injury

- Usually anomalous anatomy
- Palpate sternal notch (for high-riding innominate)
- Care with carotid sheath contents
- Mobilize (or divide) SCM for megagoiters
- Visualize inferior thyroid artery

# #3 Metabolic Crisis

## *Thyroid storm*

- **Preoperative preparation**
  - **Thyroid blockade (methimazole)**
  - **Lugol's solution or SSKI**
  - **Beta blockade**
- **Intraoperative factors**
  - **Avoid excessive manipulation of gland**
- **Treatment**
  - **Steroids, beta blockers, ATD (PTU, MTZ)**

# Thyroid Storm Medications

Medications for Treatment of Hyperthyroidism			
Class	Mechanism of Action	Medication	Starting Dose
Thionamide	Impair thyroid hormone production	Methimazole	20-40 mg PO daily or divided twice daily
		Propylthiouracil	300-600 mg PO divided every 8 hours
Beta blocker	Block catecholamine-mediated hyperthyroid symptoms	Propranolol	20-40 mg PO every 6 to 8 hours
Iodine preparation	Inhibit thyroid hormone synthesis and release	Lugol's solution	2-5 drops PO one to three times daily
		Saturated solution of potassium iodide (SSKI)	1-2 drops PO one to three times daily
Steroid	Support metabolic function in critical illness	Hydrocortisone	50-100 mg IV every 8 hours
		Dexamethasone	2 mg IV every 8 hours

# #3 Metabolic Crisis

## *Pheochromocytoma*

- **Recognition (index of suspicion)**
  - MTC
  - MEN
  - Unusual hypertension/flushing/headaches
- **Evaluation**
  - Serum or urine catecholamines
  - Abdominal CT
  - RET testing
- **Removal of pheo first**
  - Avoid excessive manipulation of gland
- **Management of blood pressure**

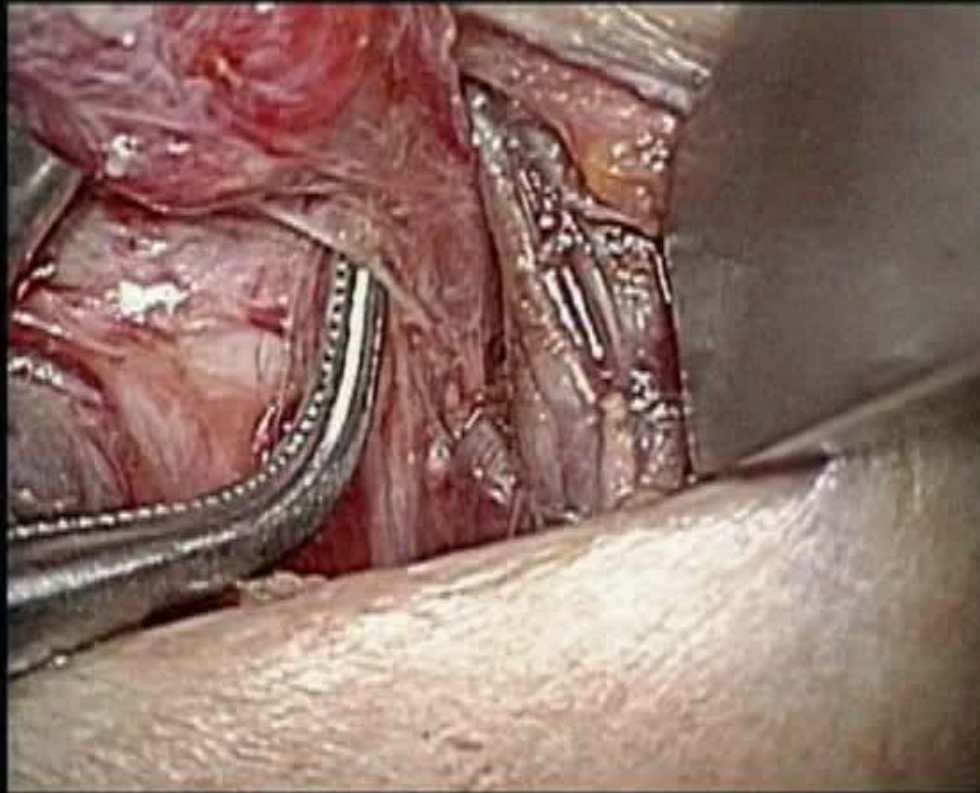


# #4 Visceral Injury

- **Identify anterior trachea inferior to isthmus**
- **Caution with advanced energy devices near trachea**
- **Consider esophagus/pharynx in posterior dissection (especially parathyroidectomy)**

# #5 Permanent Hypocalcemia

- Identify superior PTH gland early



# #5 Permanent Hypocalcemia

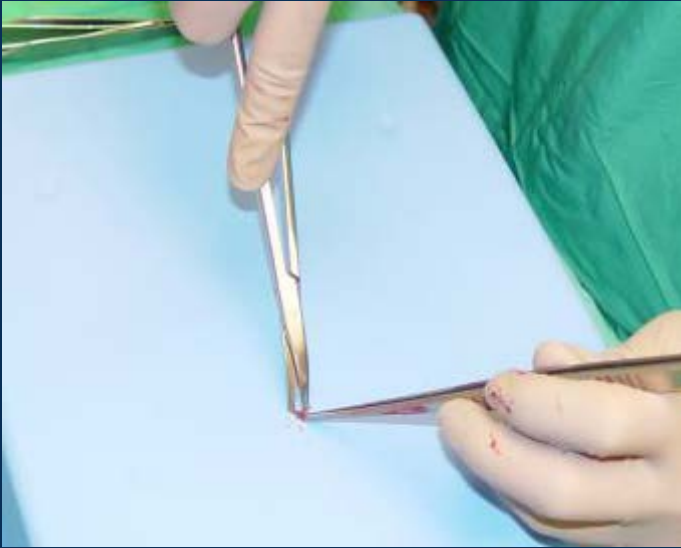
- Identify superior PTH gland early
- Meticulous ligation of inferior pole
- Careful inspection of resected thyroid



# #5 Permanent Hypocalcemia

- Identify superior PTH gland early
- Meticulous ligation of inferior pole
- Careful inspection of resected thyroid
- Liberal autotransplantation

# Autotransplantation Technique



# #5 Permanent Hypocalcemia

- Identify superior PTH gland early
- Meticulous ligation of inferior pole
- Careful inspection of resected thyroid
- Liberal autotransplantation
- Prophylactic calcium supplementation (Rocaltrol prn)

# Managing Calcium

Original Research—Endocrine Surgery

## Calcium Management after Thyroidectomy: A Simple and Cost-Effective Method

Michael C. Singer, MD<sup>1</sup>, Dimpal Bhakta<sup>1</sup>,  
Melanie W. Seybt, MD<sup>1</sup>, and David J. Terris, MD<sup>1</sup>

 AMERICAN ACADEMY OF  
OTOLARYNGOLOGY—  
HEAD AND NECK SURGERY  
FOUNDATION

Otolaryngology—  
Head and Neck Surgery  
146(3) 362–365  
© American Academy of  
Otolaryngology—Head and Neck  
Surgery Foundation 2012  
Reprints and permission:  
sagepub.com/journalsPermissions.nav  
DOI: 10.1177/0194599811433557  
<http://otojournal.org>

 SAGE

- **Oscal-D taper over 3 weeks**
- **1gm TID (1 wk)**
- **1gm BID (1 wk)**
- **1gm QD (1 wk)**
- **1gm q30 mins prn symptoms**

*Terris and Singer, OtoHNS, 2012*





# Trend toward Outpatient Surgery

THYROID

Volume 23, Number 10, 2013

© Mary Ann Liebert, Inc., and the American Thyroid Association

DOI: 10.1089/thy.2013.0049

SPECIAL ARTICLES

## American Thyroid Association Statement on Outpatient Thyroidectomy

David J. Terris,<sup>1</sup> Samuel Snyder,<sup>2</sup> Denise Carneiro-Pla,<sup>3</sup> William B. Inabnet III,<sup>4</sup> Emad Kandil,<sup>5</sup> Lisa Orloff,<sup>6</sup>  
Maisie Shindo,<sup>7</sup> Ralph P. Tufano,<sup>8</sup> R. Michael Tuttle,<sup>9</sup> Mark Urken,<sup>10</sup> and Michael W. Yeh<sup>11</sup>

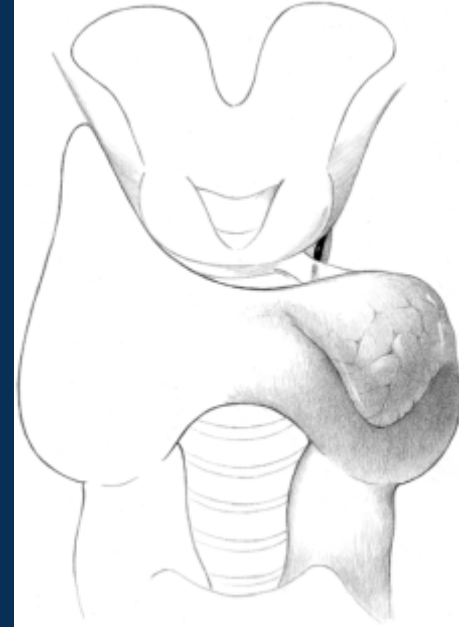
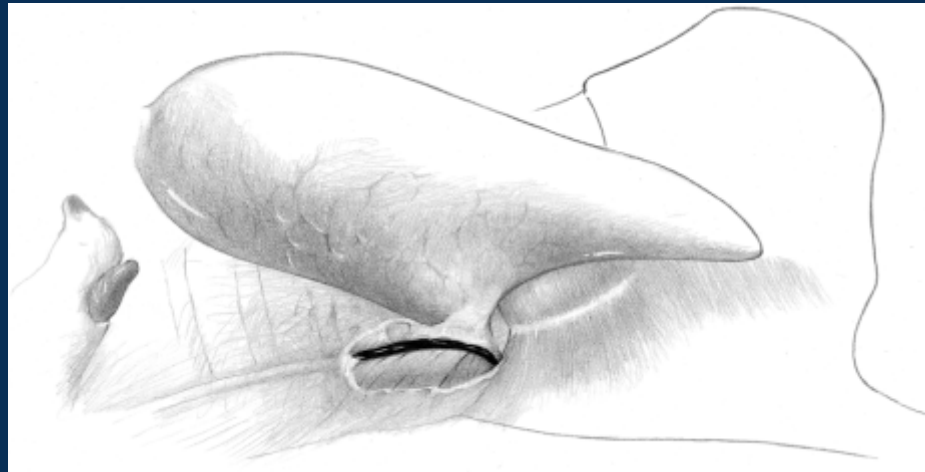
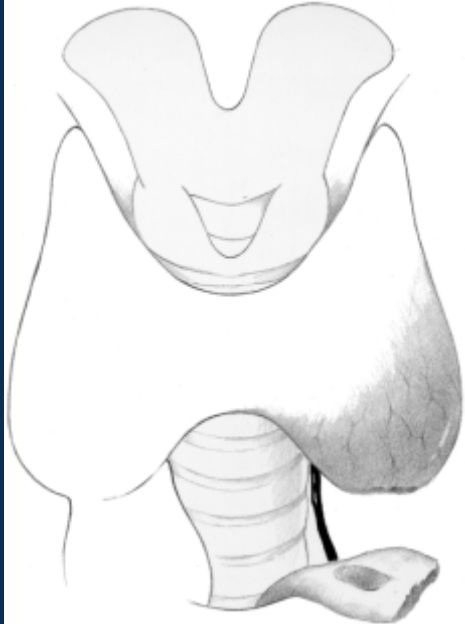
- **Outpatient thyroidectomy: 1048 patients**
- **Readmission: <1%**

David J. Terris, MD, FACS, Augusta, GA

# #6 RLN Injury (Unilateral)

- **Identification of the nerve**
  - **Proximal to ligament of Berry (under tubercle)**
  - **Thoracic inlet**
  - **Superiorly (just inferior to IC)**

# Nerve Identification



*Randolph, Diseases of Thyroid, 2003*

# #6 RLN Injury (Unilateral)

- Identification of the nerve
  - Proximal to ligament of Berry (under tubercle)
  - Thoracic inlet
  - Superiorly (just inferior to IC)
- Microdissection with magnification

# Microdissection

- Loupe magnification
- Headlight illumination



# #6 RLN Injury (Unilateral)

- Identification of the nerve
  - Proximal to ligament of Berry (under tubercle)
  - Thoracic inlet
  - Superiorly (just inferior to IC)
- Microdissection with magnification
- Control retraction on gland
- Nerve monitoring (no excuses)

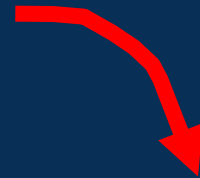
# #7 Poor Cosmetic Outcomes

- Mark patient preoperatively in upright position



# #7 Poor Cosmetic Outcomes

- Mark patient preoperatively in upright position
- Care with skin edges





# #7 Poor Cosmetic Outcomes

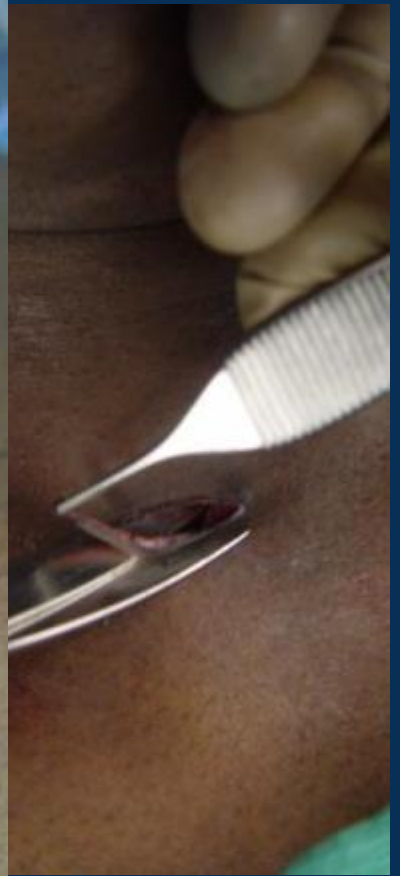
- Mark patient preoperatively in upright position
- Care with skin edges
- Trim sliver of skin

# Prevent Hypertrophic Scar



*Terris et al,  
Laryngoscope, 2007*

# Prevent Hypertrophic Scar



*ope, 2007*

# Prevent Hypertrophic Scar



# #7 Poor Cosmetic Outcomes

- Mark patient preoperatively in upright position
- Care with skin edges
- Trim sliver of skin
- Skin adhesives to avoid railroad-tracking



# #8 Retained Thyroid Tissue

- Identify Joll's space



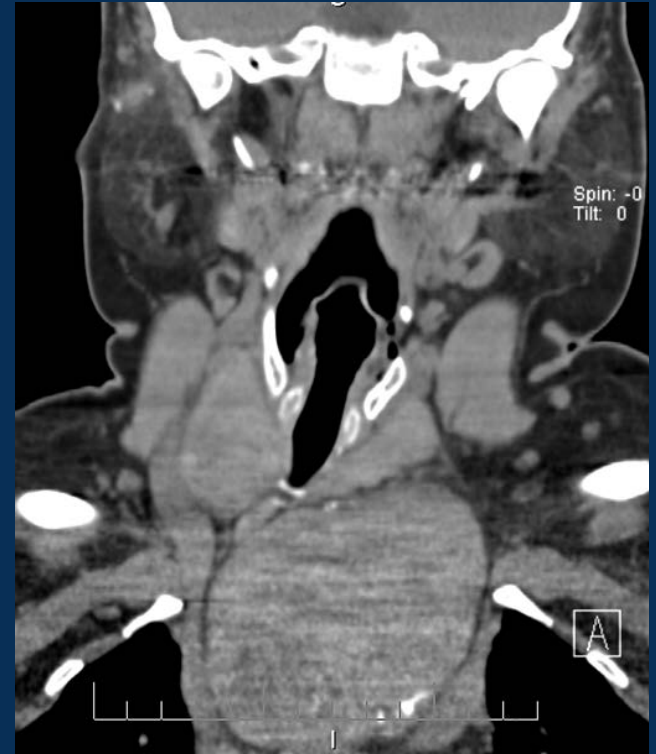
# #8 Retained Thyroid Tissue

- Identify Joll's space
- Seek pyramidal lobe



# #8 Retained Thyroid Tissue

- Identify Joll's space
- Seek pyramidal lobe
- Tedious dissection of ligament of Berry
- Substernal
  - Detach tracheal attachments
  - VATS rather than sternotomy





# #9 Wound Complications

- Prophylactic antibiotics?
- Consider avoiding Vicryl
- Forgo subplatysmal flaps



*Terris DJ, Op Tech OtoHNS, 2009*

# #9 Wound Complications

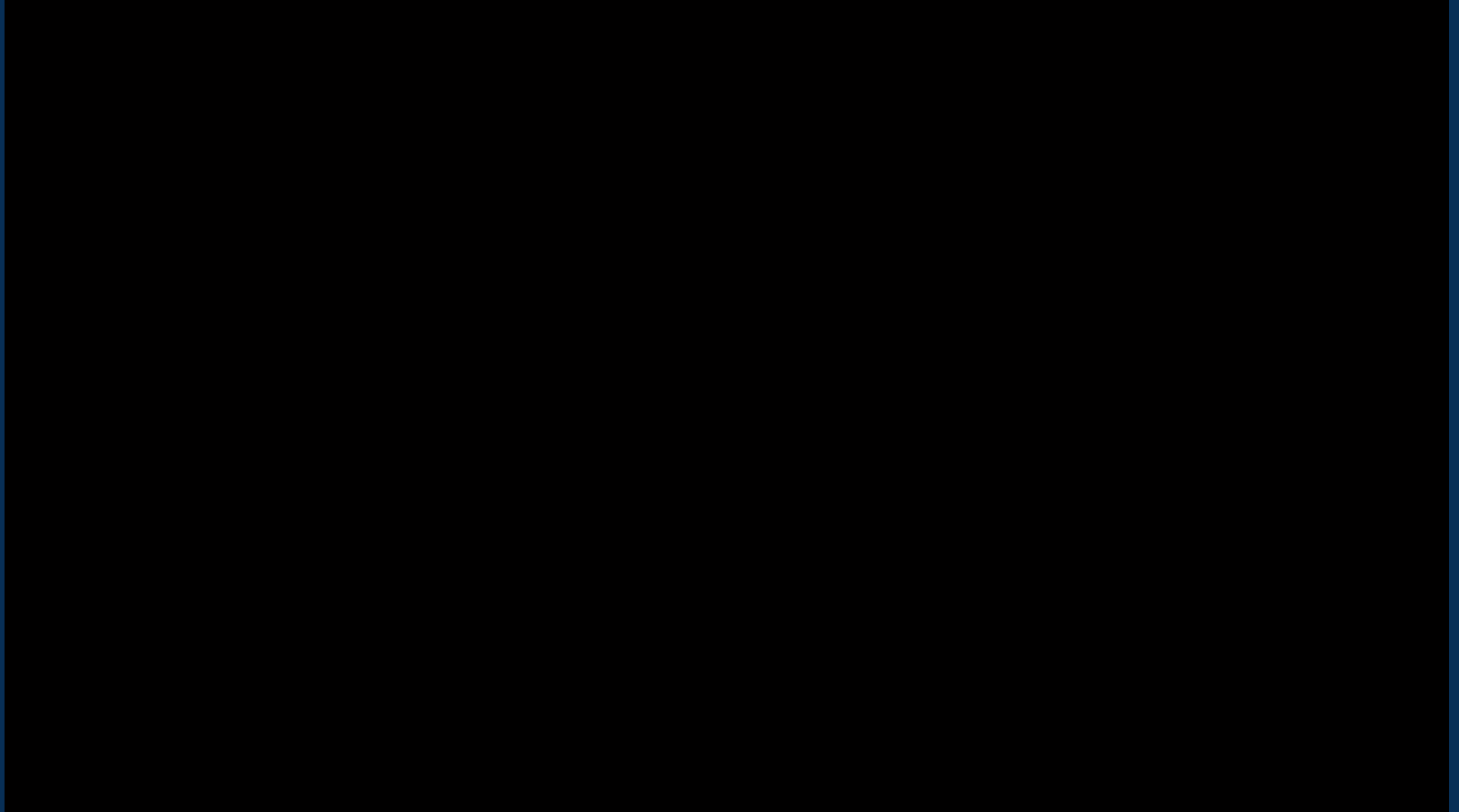
- Prophylactic antibiotics?
- Consider avoiding Vicryl
- Forgo subplatysmal flaps
- Observe seromas/small hematomas



# #10 Anesthetic Complications

- **Steroids (and Zofran) for nausea**
- **Proper (and chaperoned) introduction of EMG tube using Glidescope**

# Traumatic EMG Intubation



# Malpractice and the Thyroid

- Claims are surprisingly uncommon

*2,585,000 thyroid surgeries 1986 to 2005*

*5.9 claims per 10,000 cases*

*Singer and Terris, OtoHNS, 2012*

- Not surprisingly, most relate to nerve injury



- Nerve injury in the absence of nerve monitoring is defensible
- *Bilateral* injury increasingly difficult to defend

# Top 5 Safety Pearls

1. No closure of strap muscles
2. Identify at-risk patients
3. Stimulate side #1 RLN before side #2
4. Deep extubation
5. Routine calcium supplementation



**MCGHealth**

MCG Department of Otolaryngology  
and Thyroid Center

## **Endocrine - Head and Neck Fellowship**

**July 2021 – June 2022**

Comprehensive experience in all aspects of academic thyroid and parathyroid surgery including more than 350 surgeries per year and:

- Endoscopic minimally invasive surgery
- Outpatient surgical approaches
- Laryngeal nerve monitoring
- High-volume parathyroid program
- Ultrasound and ultrasound-guided biopsies
- Robotic thyroidectomy
- Financial incentive plan

**David J. Terris, MD**  
**Greer Albergotti, MD**

For information, send CV to [dterris@mcg.edu](mailto:dterris@mcg.edu), or  
MCG Otolaryngology, 1120 15th St BP-4109, Augusta GA 30912