Clinical Otolaryngology HNS of "Aeromedical Significance"

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CAMI Certification Flight Surgeon
Aerospace Neurotologist
CAMA AME Refresher Course
Sept 2019
The Ear
Ears: External Ear/Ear Canal

• Microtia/Malformed Pinna
  – Conductive Hearing Loss
  – Ear Canal Collapse with Headphones
Otology

External Ear

- Rarely causes aeromedical problems
- Some conditions that can interfere with flying
  - External otitis
  - Cerumen block with reduced hearing acuity

Perichondritis in a diabetic due to Pseudomonas infection
Ears: Tympanic Membrane

Our “Window” to the Middle Ear

• Perforations: Not necessarily disqualifying
  – Look for it to be dry
  – Otorrhea or granulation may indicate other pathology such as a Cholesteatoma
  – Requires FAA decision

• Ear tubes:
  – Not disqualifying
  – You can certify
Ears: Tympanic Membrane

Dry

Wet (worrisome)

Debris (Cholesteatoma)
Ears: Middle Ear

Serous Otitis Media

- Can have a Conductive hearing loss
- May indicate Eustachian Tube Dysfunction
- Use of Pneumatic Otoscopy can help
Ears: Middle Ear

Eustachian tube dysfunction

- Atlectasis
- Hemotympanum
- Can cause an ear block with deafness and/or pain
Ears: Middle Ear

Ossicular Abnormalities

- Congenital, Acquired (Traumatic)
- Otosclerosis (Stapes fixed to Oval Window)
- Conductive hearing loss (up to 60dB)
Otology

Middle Ear

- **Eustachian Tube dysfunction**
  - Can cause ear block with Hearing loss and/or pain
  - Severe block > Hemotympanum
  - Can result in Chronic Otitis Media with possible Mastoiditis and Cholesteatoma
  - New Treatment options (Balloon Tuboplasty)
Otology

Inner Ear

- Auditory System – Cochlea
  - Sensorineural hearing loss (SNHL)
  - Decreased Hearing Acuity
  - Reduced Speech Discrimination
  - AIED, PLF, Meniere’s, IEBT (Bends)

Syphilis (Congenital Syphilis at 20yr high)
Otology

Audiologic Testing

Initial assessment – Conversational Voice Test
Normal conversational volume
Candidate faces away from the Examiner at a distance of 6’
Test one or both ears hearing acuity

Causes of Failure
Reduced hearing acuity
Reduced speech discrimination or failure to comprehend English
Otology

Hearing evaluation by Audiometer

- Approved and Calibrated to ANSI 1969 standards
- Must meet hearing levels in the AME’s Guide

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>500 Hz</th>
<th>1000 Hz</th>
<th>2000 Hz</th>
<th>3000 Hz</th>
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<tbody>
<tr>
<td>Better ear (Db)</td>
<td>35</td>
<td>30</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Poorer ear (Db)</td>
<td>35</td>
<td>50</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>
Speech & the Audiogram
Otology

If fails Pure-Tone then do Speech Audio

- Must demonstrate an acceptable understanding of speech. Speech Discrimination score of at least 70% at an intensity of No greater than 65 dB in the better ear

- **Fails? Can request a MFT** (Medical Flight Test) and if passes given a **SODA** (Statement of Demonstrated Ability) along with a Special Issuance (because often not static condition).

- If a language problem exists, defer to OKC
Results of Testing:

• The need for any amplification to pass Hearing tests must be noted on 8500-8

• Typical Statement: “Auditory Amplification is Required”
  *Must* NOT state that Hearing Aids are needed.

• (**WHY?** Pilot can use aircraft radio volume or hand held radios, noise cancelling headsets, in place of hearing aid)
Otology

Really Can’t hear? (Deaf)
Can qualify for a Private Pilot Certificate if OWQ

“NOT VALID FOR CONTROL ZONES OR AREAS WHERE RADIO COMMUNICATION IS REQUIRED”

Applicants/Pilots with other Hearing devices who need a MFT should contact AMCD or RFS for MFT for check ride with an ASI

Currently Waivered with Severe HL (Deaf) N = 7
Currently Waivered with Cochlear implants N = 18
Currently Waivered with BAHA’s N = 6
Past Waivered with Implanted HA N = 1
Cochlear Implant
Cochlear Implant
Cochlear Implant
CI Accessories

Phonak ComPilot Accessory

Enjoy the convenience of connecting to phones, MP3 players, computers, and tablets.
GA Pilots with CI’s

Audio Cable is plugged into the cable of the Advanced Bionics Com Pilot

When Com Pilot turned on-receiving Audio exclusively from the Com Panel

When Blue Tooth connected, the CI turns off the Microphone - eliminates Background & engine noise

Still able to talk to Passengers with the 4 way intercom and ATC through the Headset Microphone
NORDO on SID out of KFTW
Current FAA Requirements

• Applicants/Airmen with a Cochlear Implant must undergo a MFT (Medical Flight Test) by an FAA Pilot Examiner (ASI).

• Examiner Assesses the following:
  – Communicate a Checklist with another Pilot (No lip reading)
  – Communicate with ATC and Dispatch (if appropriate)
  – Recognize changes in Engine power by vibration/instruments
  – Recognize approaching stall by buffet/visual cues (AOA)
  – Recognition of retractable gear emergencies with lights
  – May be done in Airline Simulator for 1st Class Pilots
Device Failure?

- What happens if device fails and Single Pilot?

- Use NORDO (No Radio) procedures
  - Set Transponder to 7600 (Alerts ATC of failure)
Device Failure?

- If IFR but in VFR, continue flight under VFR
- Land as soon as practical (not possible)
- If IFR in IFR conditions ATC expects you to:
  - Fly route assigned by ATC in last clearance
  - If Radar Vectored, fly direct to next Fix
  - Route advised by ATC to expect
  - Route filed by flight Plan
  - Altitude should be no lower than MEA
- Look for Signal Light Gun from Tower
Device Failure?

Radio failure? Squawk 7600

Then look for solid green “cleared to land” signal
BAHA (Bone Anchored HA)
Fully Implantable HA
Otology

General Aviation Aircraft cause hearing loss!

Always use hearing protection!
Head phones, especially the noise cancelling models are effective
Otology

Inner Ear

Vestibular System – Macule, Saccule and the Semicircular canals; Source of Spatial Disorientation illusions in the IFR environment

May become dysfunctional
- Benign Positional Vertigo (BPPV)
- Vestibular Neuronitis
- Meniere’s Disease
- Acoustic Neuroma
- Cerebellar Pathology
Vertigo

Central
- Vascular, Tumor, Migraine, Demyelinating, Psych, Trauma

Peripheral
- Meniere’s, BPPV, Vestib Neuronitis, AIED, PLF, Trauma

Non vestibular
- Ao Stenosis, Postural Hypotension, Anemia, Arrhythmias, Rx’s
Vertigo

Observations:
• Most AMEs either don’t comment or put “PRNC”

Can you fly after having Vertigo?
• “It Depends” The majority can if properly worked up

How you can help your Airmen:
• Don’t ignore 18b “Dizziness or fainting spells”
• Ask Questions
• Ask for documentation, copies of workups, tests, etc.
• Ask for an evaluation if indicated
Vertigo

What kind of questions should I ask?
(Quick screening questions)

- How long did it last? Did it come back?
- Nausea or vomiting? Incapacitation?
- Hearing loss? Tinnitus? Pressure or pain in ear?
- Visual symptoms? Headache? Photophobia?
- Falling? Loss of consciousness?
- Trauma?
- What brings it on?
- Comorbid conditions? Medications? Previous Surgery?
Vertigo

If the Vertiginous attacks lasts:

- **Seconds (consider)**
  - Benign Paroxysmal Positional Vertigo (BPPV)
  - Post-traumatic labyrinthine dysfunction
  - Orthostatic hypotension

- **Minutes (consider)**
  - Vertebrobasilar Insufficiency
  - Migraine attacks – with or without Headaches
Duration of Common Causes of Vertigo

If the Vertiginous attacks lasts:

- **Hours (consider)**
  - Meniere’s syndrome
  - Migraine attacks

- **Days-Weeks (consider)**
  - Vestibular Neuronitis
  - Acute Toxic or Traumatic Labyrinthine injury
  - Labyrinthine infection
Vertigo

Some of the more common conditions:

- Meniere’s
- BPPV
- Vestibular Neuronitis
- PLF
- SSCD
Meniere’s Disease

Aka “Cochlea Hypertension”

“Classic” Meniere’s disease:
- Episodes of vertigo lasting hours
- Fluctuating LowFreq Hearing loss
- Worsens over time
- Tinnitus
- Aural Fullness or Ear pain
- Episodic in nature and maybe “Progressive” or “Non-progressive”
- Can be associated with Migraine

Cochlear Meniere’s-No Vertigo
Benign Positional Vertigo (BPPV)

BPPV results when Otoliths from the Vestibule fall into Posterior Semicircular Canal

Classically noted when rolling over in bed, or turning head

Causes vertigo that last seconds, can occur several times a day, depending on head position

Does **NOT** cause Hearing loss

May resolve on its own, sooner with treatment
BPPV
Dix-Hallpike Maneuver

With the patient sitting, the neck is turned to one side (Use care with Elderly and those with Neck pathology)

The patient is then reclined supine rapidly, with the Head hanging over the edge of the examining table; The patient is kept in this position and observed for Nystagmus for 30 seconds. This usually appears with a Latency of a few seconds and lasts less than 30 seconds

After it stops and the patient sits up, the Nystagmus will recur but in the opposite direction and the patient is observed for 30 seconds.

The maneuver is considered the “Gold Standard” for the diagnosis of BPPV
Dix-Hallpike Maneuver

Use Frenzel Lenses
Benign Positional Vertigo (BPPV)

Treatment Options:

• Do nothing

• Canal Repositioning maneuvers
  – Semont Liberatory Maneuver
  – Epley Maneuver
  – Others

• Severe/Refractory cases - Surgery
Semont (Liberatory) maneuver

For Right Ear
Epley Maneuver

1. Sitting in a chair
2. Lying on the back with the feet up
3. Lying on the back with the head tilted to the side
4. Lying on the back with the head tilted to the other side
5. Lying on the back with the feet down

30-60 Seconds
30-60 Seconds
30-60 Seconds
30 Seconds

Finished
Repeat x 2
Vestibular Neuronitis
(aka Vestib Neuritis, Viral Labyrinthitis, Epidemic Vertigo, Acute Vestibulopathy)

Viral or bacterial infections of the Inner Ear and or 8th nerve. Not uncommon after an antecedent URI. Hearing rarely affected

Typical Viral Neuronitis
Causes episodes of vertigo that last for hours or days. The initial episode is usually the worst-Dramatic! Usually does not have Hearing loss; Often goes away on its own, but many require treatment for N/V
Perilymph Fistula

• Due to “loss of the inner ear hydraulics” from RW or OW
• History of Barotrauma or straining (“Pop”) resulting in Vertigo
• May have associated SNHL
• May heal spontaneously with bed rest
• Surgical exploration with patch to RW or OW may be required
Superior Canal Dehiscence Syndrome

First described by Dr. Lloyd Minor in 1998

**Symptoms:** Vertigo associated with Low freq sounds
Oscillopsia common with triggering activities
May have Fullness / Autophony; Inner Ear CHL

**Cause:** Dehiscence of the SSC in the MCF (L > R)

Treatment - observation or surgery
Other “Ear General” stuff

Motion Sickness
• If occurred in Flight training and resolved OK to issue

Do NOT Issue items that requires FAA Decision
• Acoustic Neuroma
• Mastoid fistula, Mastoiditis, Impaired Aeration of Middle Ear, Active Chronic Otitis Media, Progressing Otitis Externa
• First time Otologic Surgery—FAA needs to review
Acoustic Neuroma

Observe, Stereotactic Radiation, Surgery or combination thereof
## Acoustic Neuroma CACI

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<th>EVALUATION DATA</th>
<th>DISPOSITION</th>
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<td>ISSUE</td>
</tr>
<tr>
<td>B. Treated 5 or more years ago With Observation ONLY</td>
<td>Submit the following to the FAA for review: - Current status report from the treating physician with treatment plan and prognosis; - It should identify all treatment used, size of the tumor at diagnosis, and current size; - List of medications and side effects, if any; - Operative notes and discharge summary, if applicable; and - Copies of most recent imaging report(s) (MRI).</td>
<td>DEFER: Submit the information to the FAA for a possible Special Issuance. Follow up Issuance: Will be per the airman's authorization letter.</td>
</tr>
<tr>
<td>C. Treated less than 5 years ago With ANY of the following: Observation, Surgery, OR Stereotactic radiation</td>
<td>Submit the following to the FAA for review: - Current status report from the treating physician (ENT or neurosurgeon) with - Treatment plan, prognosis, and adherence to treatment; - It should indicate the presence or absence of any residual tumor and any complications; - List of medications and side effects, if any; - Operative notes and discharge summary (if applicable); SEE NEXT PAGE</td>
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AME Program
# Acoustic Neuroma CACI

**B. Treated 5 or more years ago With**
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Rhinology

“The Nose should be examined for the presence of Polyps, Blood, Signs of Infection or Allergy and Substance abuse”

- **Epistaxis** – If frequently should get it fixed! Low humidity at altitude and Aircraft O_2_ is drying both of which can exacerbate Epistaxis
- **Nasal polyps** – Can result in sinus blockage with severe pain, The pain may be severe enough to cause loss of control of the aircraft (esp. Frontals) Obstruction of Sinuses requires a FAA decision. May issue if the condition is mild and have no potential for a sinus block
- **Septal Perforation** - May whistle on expiration; Crusting and Bleeding; Due to Cocaine use or surgery?
Rhinology

Trauma to the nose
Any condition which results in obstruction to the ventilation of the sinuses is disqualifying, such as a severely deviated septum with blockage

Malignancy
All cases of Malignancy of the Sinonasal region require a FAA decision. All pertinent medical information should be submitted to AMCD
Trauma/ Septal Deviation

No Obstruction-OK to issue
Rhinology- Malignancy

All cases require FAA Decision
Rhinology

Sinusitis

**Intermittent** and responds to Tx without side effects
OK to issue

**Severe**- Requiring Continuous use of Rx’s or problems with
Barotrauma: Requires FAA Decision
Rhinology-- Polyps

- Inflammatory in nature
- Sometimes associated with allergy
- Nasal steroids can shrink or stop growth
- You can issue a certificate if...
  - Asymptomatic
  - No observable growth over 12 months
  - No potential for sinus block
- Otherwise, defer
Rhinology - Polyps & “Cysts”
Rhinology- Allergy Comorbidities

- OME
- Nasal Polyps
- Sinusitis
- Asthma
- URI
Rhinology

Radiographic Studies:
Coronal CT Scan best for diagnosing sinusitis and nasal pathology
MRI scans tend to over read any sinusitis that may be present.
Plain films are of minimal utility
Rhinology

Severe Allergic Rhinitis:

**Hay fever** Controlled by Desensitization and/or by the use of Non-Sedating Antihistamines is NOT Disqualifying.

**Severe Allergies** require a FAA decision; Submit all pertinent medical information and current status report

**Medications** used to control Allergic Rhinitis

Nasal Steroids: All current available OK to use while flying
Rhinology

Medications used for Allergic Rhinitis

Non-sedating Antihistamines are OK for use while flying Loratidine (Claritin®) and Fexofenadine (Allegra®); Must use for at least 1 week without side effects before flying

All Sedating Antihistamines are NOT to be used while flying. Rule of Thumb — 5 Dosing Intervals before Flying

No Cetirizine (Zyrtec®), Diphenhydramine (Benadryl®), etc.

Nasal Antihistamines approved: Azelastine (Astepro®)

Cromolyn Sodium (Nasalcrom®) OK to use
Diphenhydramine (Benadryl®)

Found in nearly 10% of all Fatal GA Accidents
Over 65 OTC labels contain it

Used for Allergic Reactions, Allergic Rhinitis, Cold Rx’s, Cough Rx’s, Insomnia, Motion sickness, Nausea, Hives, etc.
Rhinology

Cystic Fibrosis

There are about 20 pilots actively flying with this disease. As treatments improve, life expectancy is getting longer so more will be seeking aeromedical certification.

The major aeromedical concern is sudden Spontaneous Pneumothorax with a high recurrence rate.

Obviously Pulmonary functions and the risk is Hypoxemia is of concern; Nasal Polyposis as well.

Some may actually get a Lung transplant

*These cases all require a FAA decision.*
Visit Aviation Communities
Oral Cavity and Oropharynx

Malignant Tumors  (*Squamous Cell Carcinoma most common*)
Oral Cavity and Oropharynx

Speech

Must be able to speak English clearly

- English is used world-wide for aircraft communication
- Inability to understand or speak English is extremely disruptive to controllers, in a busy terminal area.

Stuttering would impair voice communication and the condition should be defined with a current status report and all information submitted to the FAA for decision

Palatal adhesions to the pharynx, i.e. a palatal flap done for Velopharyngeal Insufficiency (VPI), must be described and all information sent to the FAA for decision.
Oral Cavity and Oropharynx

Obstructive Sleep Apnea – Fatigue (See Next Talk)

More prevalent as more Airmen become more obese. Several events involving Aviation Safety (Significant issue in the Trucking industry)

Findings suggestive of Obstructive Sleep Apnea (OSA):
  - Short latency to sleep (Airman falls asleep in the Examining Chair)
  - Obesity and elevated BMI (body mass index)
  - Fatigue and day time somnolence
  - Loud snoring with or without snorting
  - Neck Circumference $> 17”$
Oral Cavity and Oropharynx

Obstructive Sleep Apnea (Cont’d)

- Long/Redundant Palate & Uvula
- Reduced A-P distance of Nasopharynx
- Big tongue (Fat)
- Large Tonsils/Adenoids
- Presence of a pharyngeal flap
- Recent onset of Hypertension or Drug resistant AFib
- Type II Diabetes
Large Tonsils
Breathing During Sleep

During normal sleep, air flows freely past the structures in the throat.
Breathing During Sleep

Snoring

Sleep Apnea

Tongue Fat
Obstructive Sleep Apnea (cont’d)

Many intervention strategies:
   Breathing assistance with CPAP/VPAP/BiPAP
   Weight reduction program
   Sleep Dental Appliance

Surgical treatments
   Tonsillectomy/Adenoidectomy
   Tongue stabilization/reduction; Laryngeal suspension
   Uvulopalatopharyngoplasty (UPPP)

More on this in the Talk to follow
Send to FAA for decision—Requires AASI Authorization
Uvulopalatopharyngoplasty (UPPP)
“Traditional” Head & Neck Ca (SCC)

- Older patient (late 50’s)
- Smoker
- Significant EtOH consumption
- Treated with Surgery & XRT, Occ Chemo
- Survival rates in 60% range
“Traditional” Head & Neck Ca (SCC)

Older patient 50+

- Smoker Relative Risk of 19.5x
- Heavy EtOH consumption RR 5.5x
- Both Smoker & EtOH 56.5x
- HPV+ RR soars to 230x
The New Epidemic of SCC

- Younger patient (40’s)
- White; College educated
- Non-Smoker
- Occ EtOH consumption
- Better Survival rates
- 75% are p16 and/or HPV (+)
Famous People with HPV+ SCC

Michael Douglas - “Oral Sex caused my Throat Cancer”
HPV (+) vs. HPV (-) Incidence

Age Standardized cases per 100K person years

Incidence of HPV CA

Figure 2. Age-standardized incidence of tonsillar and base of tongue cancers, Stockholm, Sweden, 1970–2006.

Human Papilloma Virus (HPV)

- Over 60 types are cutaneous – Warts
- Over 40 types infect Mucosa
  - Low Risk Types 6, 11
  - High Risk 16, 18
- Life time risk – over 80% + for HPV Ab’s
- For most (90%) it’s transient-eradicated in 1-2 yrs.
  - 15% of Men Age 50-59 continue with an active infection
- However 10% will go onto chronic infection – Cancer
Human Papilloma Virus (HPV)

- Integrates into host DNA
- Down regulates p53 Tumor inhibition gene
- Exposures occur 15-30 yrs. prior
- Virus has changed-Higher transmission rate
- Lives in the Reticulated Epithelium
  Cryptic Mucosa of Tonsils & BOT enters Lymphovascular bundles
- Cancer may be poorly differentiated-but does not behave that way
Risk Factors

- Oral Sex, Open Mouth Kissing, Sexual Intercourse
  - HIV with increase condom use has led to more oral
  - Active disease – sheds virus and can spread it
- Age of Sexual Debut
- Number of partners (Just takes one!)
  - 1-4 partners have a 2 fold risk
  - 5 or more partners 5 fold risk
- Male (increase of 225% from 1988 to 2004)
Presenting Symptoms of HPV+ SCC

McIlwain WR, Sood AJ, et al; Initial Symptoms in Patients with HPV+ and HPV- Oropharyngeal Ca, JAMA Otolaryngology HN Surgery 2014, 140, 441-7

<table>
<thead>
<tr>
<th>Presenting Symptoms</th>
<th>Prevalence (%)</th>
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<tbody>
<tr>
<td>Neck mass</td>
<td>51</td>
</tr>
<tr>
<td>Sore throat</td>
<td>33</td>
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<tr>
<td>Dysphagia</td>
<td>16</td>
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<tr>
<td>Visualized mass</td>
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<tr>
<td>Globus sensation</td>
<td>10</td>
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<tr>
<td>Odynophagia</td>
<td>9</td>
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<tr>
<td>Otalgia</td>
<td>7</td>
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</table>

Table 1. Most Common Presenting Symptoms of Human Papillomavirus–Positive Oropharyngeal Cancer from a retrospective study of 430 patients by McIlwain et al.4
HPV+ SCC of H&N

May present as Unknown Primary in 10%

May have Painless BOT or Tonsil lesion

Neck mass – Large Cystic nodes
Survival rates for HPV+ Tonsillar cancer vs. HPV-  p<0.0005

Data from Lindquist et al. In Emerging Infect. Dis. www.cdc.gov/eid
Vol. 16, No. 11, Nov 2010
BOT Primary Tumor
Challenges

Most are Married; had several partners before marrying
Can I kiss my wife? She already has it!

Women have a greater immune response to HPV than men do.

Prognosis

- HPV (+) and Non-smoker: Excellent 96% cure rates
- HPV (+) and Smoker: Intermediate Risk
- HPV (-) High Risk: High Risk
- HPV (-) and Smoker: Poorer Prognosis
Vaccine Preventable Cancer?

Gardasil® 9

HPV Vaccine Covers types 16, 18, 31, 33, 45, 52, and 58

Indicated in girls and women 9 - 45 yrs

For Prevention of: Cervical, Vulvar/Vaginal/Anal cancer

Boys/Girls age 11-12 (2 shots); Age 15 (3 shots over 6mo.)

Not effective if already exposed
Tonsillectomy with Lingual Tonsillectomy

Surgery vs. XRT vs. Chemo
All with good results
Head & Neck Cancers

How to help your Airmen

What the FAA is looking for:

1) Treatment is complete!
2) Favorable status report
3) All relevant records (Path/Op Report/ X-rays/Labs etc.)
4) Airman back to Normal living
5) Any Aeromedically significant side effects from Tx?
Laryngology

“Any condition that interferes with, or is aggravated by flying or maybe reasonably expected to do so”

- Reflux Laryngitis? Hoarseness? Trauma?
- Leukoplakia? Carcinoma in situ?
- Spasmodic dysphonia? Trach with talking valve?

If in doubt, Call the FAA or Defer the Exam
The Larynx
Laryngectomy patients

Laryngectomy is NOT a Tracheostomy

*Both have a “hole” in the neck, however the former is missing the Entire Voice Box (Larynx)*

Can you fly without a Voice Box?

FAA thinks so—We have several who do!
Tracheostomy patients

Airman with a Tracheostomy is a Deferral
Laryngectomy patients
Laryngectomy patients
Electrolarynx Hands Free Device
Blom Singer Valve

Tracheoesophageal Voice Prosthesis

Location of tissue
Vibration for voice
Tracheoesophageal Puncture and
Blom-Singer Voice Prosthesis
Esophagus
Trachea and Air from Lungs

Adjustable trachea-
Stoma valve for hands
Free operation

Cough relief flap
Air for breathing enters from the side
Adjustable magnet
HME cassette
Housing/baseplate

ATOS Free-Hands HME
Spatial Disorientation

Learn about it and give lectures

- 10% of GA Accidents are due to SD
- 90% of these are Fatal!
- Average time to incapacitation is < 3 minutes
- Variety of ways your body lies to you
- Flying is “extra-terrestrial” and our “sensors” can fail us
- Visual, Vestibular, Proprioceptive, Supra-tentorial
- Classified as Type I, Type II, Type III
Spatial Disorientation

**TYPE I (UNRECOGNIZED)**

**CLUELESS** that there is a problem. Aviator does not perceive anything is Wrong. Failure to recognize or correct usually results in a Fatality.

**TYPE II (RECOGNIZED)**

**KNOWS** there is a problem but may not recognize as SD. Pilot believes Controls not working right, there is an Instrument failure and believes Powerful Vestibular and Proprioceptive input.

**TYPE III (INCAPACITATING)**

**Pilot experiences OVERWHELMING** Sensation of Movement that he or she cannot orient using VISUAL cues or Aircraft Instruments. Often FATAL if no Co-Pilot to take over.
Spatial Disorientation
Spatial Disorientation

Graveyard Spiral & Spin
Spatial Disorientation

NVG’s FLIR entering commercial use-Air Ambulances, etc.
THANK YOU!

Questions??
Contact Information

David G. Schall, MD MPH FACS
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