ANATOMY AND SURGERY OF ORAL AND MAXILLOFACIAL INFECTIONS

GOALS OF THIS SESSION

- Update and review anatomy and surgery
- Provide for informal discussion

OBJECTIVES

- Principles of treatment
- Anatomy, clinical presentation, and surgical treatment
- Airway considerations
- Complications and unusual infections

THE PRIMARY PRINCIPLE OF THE TREATMENT OF ODONTOGENIC INFECTIONS

Any closed space that becomes infected, or any situation where an abscess forms, is an indication for surgical intervention, with or without antibiotic therapy

PRINCIPLES OF MANAGEMENT OF DEEP SPACE INFECTIONS

1. DETERMINE SEVERITY
2. EVALUATE HOST DEFENSES
3. DECIDE: INPATIENT VS. OUTPATIENT
4. TREAT SURGICALLY
5. SUPPORT MEDICALLY
6. CHOOSE ANTIBIOTIC APPROPRIATELY
7. ADMINISTER ANTIBIOTIC APPROPRIATELY
8. REEVALUATE FREQUENTLY

STEP 1: DETERMINE THE SEVERITY OF INFECTION

- ANATOMIC LOCATION
- RATE OF PROGRESSION
- AIRWAY COMPROMISE

Acknowledgement: Larry J. Peterson, DDS
DETERMINE THE SEVERITY OF INFECTION

ANATOMIC LOCATION

- Low: Buccal, infraorbital, vestibular, subperiosteal
- Moderate: Masticator, submandibular, submental, sublingual
- High: Ludwig’s, lateral or retropharyngeal, danger space, mediastinum, cavernous sinus

DETERMINE THE SEVERITY OF INFECTION

LOW SEVERITY

- Vestibular space
- Space of body of mandible

DETERMINE THE SEVERITY OF INFECTION

MODERATE SEVERITY

- Submasseteric
- Submental + Submandibular

DETERMINE THE SEVERITY OF INFECTION

HIGH SEVERITY

- Lateral Pharyngeal
- Mediastinitis

SEVERITY OF INFECTION

Montefiore Experience (N = 37)

- Dysphagia in 78%
- Trismus in 73%
- Masticator Space in 78%
  - Pterygomandibular in 60%
  - Submandibular in 54%
  - Lateral pharyngeal in 43%
- 3.3 ± 1.5 infected spaces per case


DETERMINE THE SEVERITY OF INFECTION

RATE OF PROGRESSION

- History of Swelling
- Cellulitis vs. Abscess
- Necrotizing Fasciitis
**DETERMINE THE SEVERITY OF INFECTION**

**RATE OF PROGRESSION: SIRS**

8 p.m.  12 midnight

**SYSTEMIC INFLAMMATORY RESPONSE SYNDROME**

**SIRS IS > 2 OF:**

- 36°C < T > 38°C
- P > 90
- R > 20
- MAP < 32
- 4 < WBC > 12
- BANDS > 10%

**LOOK FOR ORGAN DAMAGE:**

- KIDNEYS
- LIVER
- LUNGS
- BRAIN
- EXTREMITIES

**DETERMINE THE SEVERITY OF INFECTION**

**CELLULITIS vs. ABSCESS**

Cellulitis  Abscess

**DETERMINE THE SEVERITY OF INFECTION**

**NECROTIZING FASCIITIS**

2 d postop  5 d postop

**DETERMINE THE SEVERITY OF INFECTION**

**AIRWAY COMPROMISE**

- RECENT HISTORY
- PHYSICAL EXAMINATION
  - POSTURE AND ACCESSORY MUSCLES
  - VOICE QUALITY AND VOLUME
  - CONTROL OF SECRETIONS
  - TRISMUS AND VIEW OF PHARYNX
  - RESPIRATIONS AND O2 SATURATION
- CT, IF PRUDENT
- AIRWAY MANAGEMENT PLAN

**DETERMINE THE SEVERITY OF INFECTION**

**AIRWAY COMPROMISE: POSTURE**

Left lateral pharyngeal space
DETERMINE THE SEVERITY OF INFECTION

TRISMUS BLOCKS VIEW OF PHARYNX

Masticator space: trismus and airway distortion

DETERMINE THE SEVERITY OF INFECTION

AIRWAY COMPROMISE: Lightspeed CT

Pterygomandibular, LPS, RPS compressing airway

Uses of CT in Infections

• CECT + Physical exam: 89% accuracy, 95% sensitivity, 80% specificity in identifying “drainable pus” (Miller, et al., 1999)
• Postop evaluation q 48-72 h
• To evaluate for extubation?

Uses of CT in Infections

Rim-enhancing hypodensity

Significant airway edema

STEP 2: EVALUATE HOST DEFENSES

IMMUNE SYSTEM COMPROMISE

• DIABETES
• STEROID THERAPY
• ORGAN TRANSPLANTS
• MALIGNANCY
• CHEMOTHERAPY
• MALNUTRITION
• ALCOHOLISM
• END-STAGE AIDS

STEP 2: EVALUATE HOST DEFENSES

DIABETES

• Zheng L, et al., JOMS, 2011

Diabetic patients had infections that involved more spaces, longer hospital stays, and more frequent complications
**EVALUATE HOST DEFENSES**

**SYSTEMIC RESERVE**

- **HOST SYSTEMIC RESPONSE:**
  - FEVER, DEHYDRATION, ↑ CRP*, LEUKOCYTOSIS, OXYGENATION

- **CONTROL OF SYSTEMIC DISEASES:**
  - BLOOD SUGAR, BLOOD PRESSURE, CREATININE, ETC.

*Ylijoki, et al. JOMS 59:867, 2001

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**STEP 3: DECIDE ON THE SETTING OF CARE**

**CRITERIA FOR ADMISSION**

- T > 101°F
- Dehydration
- Impending airway compromise or threat to vital structures
- Infection of deep neck spaces or masticator space
- Need for general anesthesia
- Need for inpatient control of systemic disease

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**DECIDE ON THE SETTING OF CARE**

**ERR ON THE SIDE OF ADMISSION**

- AIRWAY SECURITY
- CONSULTATION AND CT AVAILABLE

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**STEP 4: TREAT SURGICALLY**

**WHEN TO GO TO THE OR**

- **FOR AIRWAY SECURITY**
  - MODERATE-HIGH ANATOMIC SEVERITY
  - MULTIPLE SPACE INVOLVEMENT
  - RAPIDLY PROGRESSING INFECTION
  - NEED FOR GA

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**Mortality due to Ludwig’s Angina**

- Williams (1940) – 54%
  - Emergent tracheotomy
- Williams and Guralnick (1943) – 10%
  - Early intubation or tracheotomy
- Hought, Fitzgerald, et al. (1980) – 4%
  - Medical compromise implicated

**AIRWAY SECURITY AND AGGRESSIVE SURGERY**

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**AIRWAY MANAGEMENT TECHNIQUES**

- LOCAL ANESTHESIA
- CONSCIOUS SEDATION
- BLIND AWAKE INTUBATION
- LARYNGEAL MASK AIRWAY
- FIBEROPTIC INTUBATION
- TRACHEOTOMY/CRICOTHYROTOMY
- HIGH FREQUENCY JET VENTILATION
- PERCUTANEOUS TRANSTRACHEAL VENTILATION
**AIRWAY MANAGEMENT PLAN**

Fiberoptic intubation

Tracheotomy

Blind awake intubation

(abscess rupture)


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**Tracheotomy vs. Endotracheal Intubation**

**Tracheotomy**

- **Pros:** secure airway, patient comfort, less need for sedation, decreased total days of mechanical ventilation, facilitates pulmonary toilet, earlier resumption of autonomy

- **Cons:** surgical procedure, bleeding, scarring, pneumothorax, tracheal stenosis

**Endotracheal Intubation**

- **Pros:** nonsurgical procedure

- **Cons:** patient discomfort, non-secure airway, requirement of mechanical ventilation, and laryngotracheal stenosis

**Comparative Costs**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracheotomy</td>
<td>81,000.00</td>
</tr>
<tr>
<td>Endotracheal Intubation</td>
<td>94,299.00</td>
</tr>
</tbody>
</table>

Potter, Herford, Ellis, JOMS, 2002

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**BENEFITS OF TRACHEOTOMY**

**GREATER RISKS IN EMERGENT, INFECTED CASES?**

  - Tracheotomy benefits: less sedation, better comfort, and early resumption of autonomy
  - No difference in LOS

- Terragni PP, JAMA, 2010
  - No significant difference in VAP

  - 29 deep neck infections safely tx w/o trach

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**SURGEON’S ROLE IN AIRWAY MANAGEMENT**

- Respect the judgement of an experienced anesthesiologist, but communicate

- Be scrubbed and ready to trach

- Needle decompression
Mortality due to Ludwig’s Angina

• Williams (1940) – 54% emergent tracheotomy
• Williams and Guralnick (1943) – 10% early intubation or tracheotomy
• Hought, Fitzgerald, et al. (1980) – 4% medical compromise implicated

SURGICAL TREATMENT OF OROFACIAL INFECTIONS

• ESTABLISH DEPENDENT DRAINAGE
• REMOVE THE CAUSE
• CULTURE AND SENSITIVITY
• EMPIRIC ANTIBIOTICS

ESTABLISH DEPENDENT DRAINAGE

INCISIONS FOR EXTRAORAL I&D

LATERAL PHARYNGEAL SPACE I&D

TIMING OF INCISION AND DRAINAGE

• PROGRESSION OF INFECTION THROUGH THE NECK
• DRAINING A CELLULITIS IS OKAY!
PROGRESSION OF INFECTION THROUGH THE NECK
1. Lower third molar
2. Periapical abscess
3. Submandibular space
4. Buccopharyngeal gap
5. Lateral pharyngeal space
6. Retropharyngeal space
7. Danger Space
8. Mediastinum

DRAINING A CELLULITIS
- Aborts spread of infection (Montefiore study experience)
- Length of stay not significantly longer
  - $4.7 \pm 2.7 \text{ d vs. } 6.1 \pm 3.6 \text{ d}$
  - Severity greater in cellulitis group
- Good specimens obtained


Predictors of Abscess Formation
Montefiore Experience ($N = 37$)
- Multivariate analysis
- Potential Predictors ($P < .15$)
  - Peptostreptococci, Prevotella or Porphyromonas, non-third molar upper or lower posterior teeth, age
  - Peptostreptococci was the only significant negative predictor of abscess formation ($OR = 0.86, P = 0.04$)
- No association with:
  - duration of preoperative swelling, severity score, WBC, initial core temperature, preadmission antibiotics, or immune system compromise


REMOVE THE CAUSE
- EXTRACTION
- ROOT CANAL
- CURETTAGE

IS SURGICAL I&D ALWAYS NECESSARY?
- ENT LITERATURE: OPERATE ONLY FOR PUS
  - ODELL: J OTOLARYNGOL 1980
  - PAONESSA, ET AL.: OTOLARYNGOL CLIN N AM 1976
  - TOM, ET AL.: LARYNGOSCOPE 1988
- PERCUTANEOUS CATHETER DRAINAGE
  - COLE, ET AL.: RADIOLOGY 1984
  - ODELL: J OTOLARYNGOL 1980
  - YUSA, ET AL.: IJOMS 2001
  (Color Ultrasound Guidance)

MY OPINION
- DRAIN IMMEDIATELY ALL DEEP FASCIAL SPACES AFFECTED BY
  - CELLULITIS
  - ABSCESS
**STEP 5: MEDICAL SUPPORTIVE CARE**

- FLUIDS, ELECTROLYTES
- NUTRITION
- CONTROL OF SYSTEMIC DISEASE

**STEPS 6 AND 7: CHOOSE AND ADMINISTER ANTIBIOTICS APPROPRIATELY**

- MICROBIOLOGY (CHOICE)
- ANTIBIOTIC THERAPY (ADMINISTRATION)

**STEP 8: FREQUENT REEVALUATION**

- CLINICAL REEXAMINATION
- POSTOPERATIVE CT (Q 48-72 h?)
- RISING CRP ON DAY 2 → REOPERATION*
- REPEAT CULTURES
- CRITERIA FOR CHANGING AB’S
- DURATION OF ANTIBIOTIC THERAPY

* Ylijoki, et al. JOMS 59: 867, 2001

**REASONS FOR TREATMENT FAILURE**

- INADEQUATE SURGERY
- DEPRESSED HOST DEFENSES
- FOREIGN BODY
- ANTIBIOTIC PROBLEMS: RESISTANCE, COMPLIANCE, ABSORPTION, DOSAGE, ALLERGY, TOXICITY
- SUPERINFECTION
- CHANGE IN FLORA: RECULTURE

**CAUSES OF PROLONGED WOUND DRAINAGE**

*MNEMONIC = FETID*

- Foreign body ~ bone plate, implant
- Epithelium ~ sinus tract/fistula
- Tumor ~ carcinoma
- Infection persisting ~ resistant bacteria, immunocompromise
- Distal obstruction ~ sialolithiasis, sinusitis


**REASONS FOR TREATMENT FAILURE**

- INADEQUATE SURGERY
- ANTIBIOTIC PROBLEMS
WHEN TO CHANGE ANTIBIOTICS

- Allergy or toxic reaction
- At least 48 h of I.V. antibiotic (72 h for oral)
- Deterioration after repeat I&D and/or postop CT
- C&S report indicating resistance
- Necrotizing fasciitis

WHEN TO TAKE BLOOD CULTURES

- Rigors (shaking chills)
- T > 102 °F
- Deteriorating patient
- More than 2 catheters
  - Culture the tips of the catheters!

CRITERIA FOR EXTRUSION

- Recovery from GA and paralyzing agents
- Stable and acceptable vital signs
- Acceptable ventilatory parameters
- Acceptable O2 Sat and CO2
- Able to swallow (if tracheotomy)
- Air leak (breathing around ETT)

ACCEPTABLE VENTILATORY PARAMETERS

- 10 < respirations < 25
- Vital capacity > 15 mL/kg
- Inspiratory force > 25 cm H2O
- Minute ventilation = 6-10 L/min
- Normal blood gases and/or normal O2 Sat and E.T. CO2

All these apply to the lower airway!

EXTUBATION TECHNIQUE

- Consider or
- Trach set ready
- Suction ETT and pharynx
- Lidocaine
- Deflate cuff
- Oxygenate
- Extubate over stylet

Especially consider this in the severe case/difficult airway/obese pt.

CRITERIA FOR DISCHARGE

- Extubation
- T < 100° for 24 hours
- Oral intake > 10 ml/kg/shift for 2 shifts
- All drains out, swelling ↓↓
- Minimal or no drainage
- Adequate control of systemic disease
- Ambulation
Predictors of Length of Stay

Montefiore Experience (N = 37)

- Multivariate analysis
- Potential Predictors (P < .15)
  - WBC, immune system compromise, SS, number of infected spaces, time in the operating room, space 3 infection, number of involved teeth, infection of upper third molars, infection of non-third molar lower posterior teeth, PTF, and reoperation.
- Significant Predictors:
  - number of infected spaces, OR time, and infection of non-third molar lower posterior teeth, PTF, reoperation (R² = 0.84)
- In summary:
  - extent of infection and complications

Predictors of Length of Stay

Literature Review

- Number of involved spaces (1, 2)
- Complications (1, 2)
- Diabetes (2)
- Neck swelling (3)
- CRP > 100 (3)
- Trismus (3)
- Odontogenic - negative predictor (2)


Deep Spaces Associated with any Odontogenic Infection

- Vestibular
- Buccal
- Subcutaneous

Vestibular Space

- Between the oral mucosa and the nearby muscle of facial expression
  - Orbicularis Oris
  - Buccinator
BUCCAL SPACE

Extraoral drainage between mentalis and depressor anguli oris mm.

BUCCAL vs. VESTIBULAR SPACE

ORAL vs. SKIN SIDE OF BUCCINATOR

BUCCAL SPACE

SPACE OF THE BODY OF THE MANDIBLE

SUBPERIOSTEAL SPACE SURROUNDING THE MANDIBLE

DEEP SPACES ASSOCIATED WITH MANDIBULAR INFECTIONS

- SPACE OF BODY OF MANDIBLE
- SUBLINGUAL
- SUBMANDIBULAR
- SUBMENTAL
- MASTICATOR
- LUDWIG’S ANGINA
SUBLINGUAL SPACE
- Continuous with submandibular
- Buccopharyngeal gap to lateral pharyngeal space

SUBLINGUAL SPACE
CLEAVAGE PLANE TO EPIGLOTTIS

SUBLINGUAL SPACE
- Anterior and posterior bellies of digastric
- Mylohyoid muscle
- Inferior and part of lingual surface of mandible
- Connections to lateral pharyngeal, sublingual, and submental spaces

SUBMENTAL SPACE
- Midline space
- Anterior digastric muscles
- Continuous with submandibular

SUBMANDIBULAR SPACE
- Red = submandibular; blue = confluence of spaces
LUDWIG’S ANGINA

BRAWNY INDURATED CELLULITIS

- SUBLINGUAL
- SUBMANDIBULAR
- SUBMENTAL

MASTICATOR SPACE

A GROUP OF SPACES

- SUBMASSETERIC
- PTERYgomandibular
- SUPERFICIAL TEMPORAL
- DEEP TEMPORAL
  - INFRATEMPORAL

PTERYGOMANDIBULAR SPACE: 78% OF CASES

MASTICATOR SPACE

COMPONENTS USUALLY ACT SEPARATELY

- SUBMASSETERIC
- PTERYgomandibular
- SUPERFICIAL TEMPORAL
- DEEP TEMPORAL
  - INFRATEMPORAL

SUBMASSETERIC SPACE

CASE PRESENTATION

What would you do?

79 year old female. H/o kyphosis with multiple back surgeries. Was given PCN for 1 week with no improvement.
Temperature 101.8 degrees; White Blood Cell Count 18.8
Fosamax for 10 years; Zometa 2X in past year

Which antibiotic would you choose?

Now on Unasyn (Ampicillin + Sulbactam) X 2 days
Not improving clinically

Now Medicine Service consults you.
What do you recommend?

Will you extract #17?

Note ectopic calcifications at the arrows

Incision and drainage of submasseteric and pterygomandibular spaces
Extraction of #17 and #25

Groove in #17 left by inferior alveolar nerve
Note the drain at the far right green arrows

PTERYGOMANDIBULAR SPACE

PTERYGOMANDIBULAR SPACE I & D
**TEMPORAL SPACE**

**LATERAL PHARYNGEAL SPACE**
- Continuous with retropharyngeal, submandibular, and sublingual
- Anterior and posterior compartments
- Carotid sheath ("herald bleeds")

**LATERAL PHARYNGEAL SPACE**

**RETROPHARYNGEAL SPACE**
- Continuous with lateral pharyngeal and pretracheal spaces
- Alar fascia separates RPS from danger space

**RETROPHARYNGEAL SPACE**
- Pterygomandibular space abscess spreading into lateral and retropharyngeal spaces
- Danger space is next
THE DANGER SPACE
- BASE OF SKULL TO DIAPHRAGM
- FUSION OF ALAR AND RETROPHARYNGEAL FASCIAE AT C6-T4
- CONTINUOUS WITH POSTERIOR MEDIASTINUM (GREAT VESSELS)

DEEP SPACES ASSOCIATED WITH MAXILLARY INFECTIONS
- PALATAL
- INFRAORBITAL
- ORBITAL
- BUCCAL
- INFRATEMPORAL

PALATAL SPACE
- SUBPERIOSTEAL SPACE OF PALATE
- LATERAL INCISORS
- BICUSPID AND MOLAR ROOTS

INFRAORBITAL SPACE
- DRAINAGE MEDIAL OR LATERAL TO LEVATOR LABII SUPERIORIS

INFRAORBITAL SPACE
- QUADRATUS LABII SUPERIORIS MUSCLE
- ANGULAR AND INFERIOR OPHTHALMIC VEINS TO CAVERNOUS SINUS

BUCCAL TO INFRATEMPORAL SPREAD
UNUSUAL MAXILLOFACIAL INFECTIONS AND COMPLICATIONS

NECROTIZING FASCIITIS
- DUSKY, PARESTHETIC SKIN
- VESICLES EARLY, NECROSIS LATE
- DISSECTION ALONG PLATYSMA
- FASCIOTOMY, WIDE UNDERMINING, WOUND PACKING, BIOPSY FASCIA, GRAM STAIN, C&S
- REPEAT SURGERY
- MEDICAL MANAGEMENT
  - BROAD-SPECTRUM AB’S, FLUIDS, CALCIUM, BLOOD, CONTROL PREDISPOSING DISEASE

ANTIBIOTICS FOR NECROTIZING FASCIITIS

POLYMICROBIAL (odontogenic)
- Carbapenem (imv, meropenem)

STREPTOCOCCAL (Group A, C, G)
- Penicillin G + Clinda

CLOSTRIDIAL
- Penicillin G + Clinda

MRSA
- Imipenem + vanco-daptomycin

KLEBSIELLA
- Carbapenem (+ Colistin if KPC/ESBL+)

EMPICRIC THERAPY:
Gram stain + C&S
Carbapenem + Vanco- or Daptomycin

NECROTIZING FASCIITIS

METABOLIC CHANGES

• HYPOCALCEMIA DUE TO PRECIPITATION OF CA++ IN NECROTIC FAT
• HEMOLYTIC ANEMIA DUE TO BACTERIAL ENZYMES
• HYPOVOLEMIA DUE TO 3rd SPACE AND WOUND FLUID LOSSES

NECROTIZING FASCIITIS

LITERATURE REVIEW

• IMMUNOCOMPROMISE 22-64%
• GAS ON CT SCAN 55%
• REOPERATION 80%
• MORTALITY 0-19%
• FACTORS INCREASING MORTALITY
  – IMMUNOCOMPROMISE
  – DELAY IN SURGERY > 24h
  – MEDIASTINITIS


INVASIVE STREPTOCOCCAL INFECTIONS

GROUP A β-HEMOLYTIC STREPTOCOCCI

• 3.5 cases per 100,000 in US
  – ↑ in extremes of age, African-Americans
• Streptococcal pyrogenic exotoxin (SpeB) degrades C3b, interfering with opsonization, phagocytosis, and chemotaxis
• Biopsy: no WBC’s near Gm+ cocci
• Mortality 14%: 36% with STSS, 24% with NF
• Prevention: Strep B vaccine?, not AB’s


STREPTOCOCCAL TOXIC SHOCK SYNDROME

INVASIVE GROUP A β-HEMOLYTIC STREPTOCOCCI

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• Mortality 14%: 36% with STSS, 24% with NF
• Prevention: Strep B vaccine?, not AB’s


STREPTOCOCCAL TOXIC SHOCK

TREATMENT

1. Fluid resuscitation
2. Correct underlying disease (local infection, heart disease, diabetes)
3. Pen G or ceftriaxone + clinda + IVIG (globulins)
4. Activated Protein C (drotrecogin = Xigris®) - contraindicated in recent surgery (bleeding)
5. Blood sugar target = 150-180
6. Vasopressors (target MAP > 65)
7. Low dose steroids ?benefit


MEDIASTINITIS

INFECTION IN THE SPACE BETWEEN THE LUNGS, SURROUNDING THE HEART
## MediaSTinitis

**Open Thoracotomy Is Becoming Standard**

- 47% mortality with cervical approach
- 19% mortality with open thoracotomy and direct dependent mediastinal drainage (Corsten)
- Delay a factor in mortality (Marty-Ane)
- 0% mortality with CT 2-3d postop or with deterioration (Freeman)
  - 6 + 2 surgeries per patient (N=10)
  - 4 + 1 cervical i&d's; 2 + 1 thoracic i&d's; 6 + 4 ct's
  - LOS = 46 ± 10 (14-113) days
- VATS (Video-assisted thorascopic surgery) decreases morbidity; diabetes + K. pneumoniae increase mortality (Chen)

Freeman et al., J Thorac Cardiovasc Surg, 119:260, 2000; Roccia et al., JOMS 65:1716, 2007;

## Lemierre’s Syndrome

- Oropharyngeal source of infection
- Septicemia, fever preceding LPS infection by 4-5d
- Internal jugular thrombophlebitis
- Metastatic lung abscesses
- Septic arthritis, bone abscesses
- Jaundice, albuminuria, leukocytosis
- Fusobacterium necrophorum

Avoid macrolides – fusobacteria resistant

## Treatment of Lemierre’s Syndrome

- Incision and drainage
- Airway, pulmonary, medical support
- Anticoagulation
- Long-term antibiotics

Only effective FQ’s - Levo- and Gatifloxacin

## Orbital Infections

**Causes:** Sinusitis, trauma, surgery, URI, dental

- Ethmoid sinus and lamina papyracea
- Inferior ophthalmic vein to cavernous sinus

## Subperiosteal Orbital Abscess

## Cavernous Sinus Thrombosis

**Anatomy**

- Three pathways to the cavernous sinus
  - Anterior, via ophthalmic v.
  - Posterior, via pterygoid plexus and emissary veins
  - Cervical, via internal jugular (Lemierre’s syndrome)
- Cranial nerve anatomy within the sinus
- Bilateral vascular connections between cavernous sinuses

*Earliest clinical sign of CST = retinal venous congestion in the opposite eye*
CAVERNOUS SINUS THROMBOSIS

MOODERN CAUSATION

- Antibiotics have greatly decreased incidence of dental and facial causes
- Most common modern cause: sphenoid sinusitis
- Sphenoid sinusitis-associated CST difficult to diagnose
  - 50% morbidity
  - 50% mortality
- Other causes of CST: orbital, pulmonary, vascular, idiopathic


ASSOCIATED PATHOLOGY

- Sphenoid bone osteomyelitis (direct extension of sphenoid sinusitis)
- Subdural empyema, meningitis
- Thrombosis of other dural venous sinuses (sagittal, transverse, intercavernous)
- Cranial nerve injuries (II, III, IV, V, VI)
- Pituitary gland necrosis (hypopituitarism)


DIAGNOSIS

- Contrast-enhanced CT
  - Filling defect in affected cavernous sinus (curved arrow)
  - Bulging of lateral sinus wall (small straight arrow)
  - Narrowing of intracavernous carotid artery
- Magnetic resonance venogram (MRV)
  - Similar findings to CT; more sensitive?
- Ophthalmic findings
  - Contralateral dilated retinal veins
  - Proptosis, bilateral orbital swelling
- Cranial nerve defects: VI, then V-V

MRV from Ebright, 2001

WHAT DOES THIS SLIDE DE用来MSTRATE?

SEPTEMBER 28, 1981

TWO WEEKS POSTOP

8:00 pm Midnight
BRAIN ABSCESS

- Headache
- CT Diagnosis
- Ear and sinus infections 38-50%
- Vascular 30%
- Idiopathic 10-25%
- Dental 0-2%

BRAIN ABSCESS CASE REPORT

- 7 days post apico #7
- 4 month h/o headache
- Long h/o sinusitis
- No cranial nerve deficits
- No external swelling
- Head and neck flora
- Left frontal and maxillary sinusitis directly opposite left frontal brain abscess
- Ring enhancement takes 6 weeks

OSTEOMYELITIS

ANTIBIOTIC THERAPY BASED ON BONE CULTURES

- Difficulty in diagnosis
  - Bone scans nonspecific; x-rays show bone loss late (CT helpful)
  - Pathology + surgical evaluation
- Surgical debridement
  - Specimens for path, culture & sensitivity
  - Debridement, decortication, resection
  - Rigid fixation prn
- Long term antibiotics (6 weeks?)
  - Fluoroquinolones, Augmentin helpful in avoiding PICC line, e.g. in IVDA
  - Decreasing urine Lysylpyridinoline (LP) → treatment success*
  - Normalization of CRP?, ESR?


MRONJ: DENOSUMAB

BLACK-PIGMENTED BONE + SINUS = AUGMENTIN

THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

trflyn2@gmail.com