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Evaluation and Treatment of Orbital Cellulitis

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Orbital Cellulitis

- Generic terminology describing infection of tissues behind the orbital septum
- May be associated with severe vision and life-threatening complications
  - Compressive optic neuropathy
  - Cavernous sinus thrombosis
  - Meningitis
  - Intracranial abscess formation

Causes Orbital Cellulitis

- Trauma
  - Insect bites
  - Penetrating trauma
  - Orbital fractures
- Foreign body
  - Metallic
  - Unlikely to develop cellulitis
  - Organic
  - Implants
    - Scleral buckles
    - Glaucoma devices
    - Other orbital implants

Orbital Cellulitis due to Infected Implant

- Orbital implants uses for fractures
- Retinal surgery encircling elements
- Glaucoma valves
- Surgery requires removal of implant

Financial Disclosure

- I have no financial interests or relationships to disclose.

Historical Perspective (early 1900s)

- No antibiotics available
- No accurate radiographic imaging
- Only medical treatment was nasal packing soaked in epinephrine
- Many patients had spontaneous resolution
- Mortality rate approached 20%
Causes Orbital Cellulitis

- Extension for adnexal structures
  - Endophthalmitis
  - Dacryocystitis

Pediatric Orbital Cellulitis

- MUCH more common in pediatric population
- Higher incidence of acute sinusitis
- Smaller space for sinus/nasal drainage
- Thinner and more perforate orbital walls adjacent to sinuses
- ?? More susceptible immune system

Orbital Cellulitis

- Most common cause of orbital cellulitis is extension of infection from an adjacent sinusitis

What is NOT Orbital Cellulitis?

- Thyroid orbitopathy
- Orbital tumors
- Inflammatory orbital pseudotumor
- Carotid-cavernous fistula
Orbital Cellulitis Evaluation

- History of URI, sinusitis, nasal congestion
- Fever
- Loss of appetite
- Malaise
- Eyelid edema
- Proptosis
- Pain with extraocular motility

Orbital Cellulitis Evaluation

- Visual acuity usually unaffected
  - May be difficult to measure
    - Poor effort
    - Exposure
  - Additional assessment of visual function useful
    - Pupillary reaction
    - Color vision

Orbital Cellulitis Evaluation

- Extraocular motility may be restricted
- Globe may be displaced

Orbital Cellulitis Evaluation

- Optic nerve findings may suggest compression
- If trauma suspected, examine eyelids for entry wound of potential foreign bodies

Diagnosis Orbital Cellulitis

- Radiographic imaging REQUIRED
  - CT scan is excellent
  - IV contrast may help differentiate true abscess formation versus inflammatory phlegmonous involvement of orbital tissues

MRI Orbital Cellulitis

- May provide enhanced imaging of a foreign body
- MRI better for evaluating intracranial involvement
- MRI may be desired if serial imaging is anticipated (decreased radiation exposure)
Management Orbital Cellulitis

- Obtain cultures when possible
- Blood cultures only positive about 6% of time
- Eye discharge culture - 66% positive
- Nasal swab - 75% positive
- Sinus irrigation - 60% positive
- Orbitotomy - almost 100% positive
  - Yen, Texas Children's Hospital, 2001-2005

Orbital Cellulitis Management

- Aggressive nasal hygiene
  - Nasal saline irrigation promotes sinus clearance
  - Nasal corticosteroids
    - Decreases mucosal edema
    - Reduces adhesions and septations
  - Decongestants (Afrin)
    - Limit duration of use
  - Coordinate with ENT

Antibiotic Treatment Orbital Cellulitis

- Intravenous antibiotics
  - Initiate broad spectrum coverage
  - Staph and strep most common organisms in younger children
  - Polymicrobial in older patients
  - Assume antibiotic resistance (MRSA)
- Vancomycin, clindamycin, cefotaxime is one preferred initial treatment

Intravenous Corticosteroids

- 0.25-0.50 mg/kg dexamethasone divided BID
- Reduces inflammatory response in orbit
- Reduces development of adhesions and septations
- Decreases mucosal edema
- Only used in conjunction with broad spectrum antibiotic coverage
- Does NOT increase incidence of complications (intracranial extension, sepsis)

Monitoring Medical Therapy

- Follow constitutional signs
- Vital signs - signs of sepsis?
- Defervescence
- Return of appetite
- Improvement in malaise
- Constitutional signs are the first to improve and most reliable indicators of infection control

Monitoring Medical Therapy

- Monitor visual function
  - Visual acuity
  - Pupillary reaction
- Improvement in pain with extraocular motility
- Less tenderness of orbital tissues
- Don’t be fooled by worsening edema, proptosis, or size of abscess on CT scan
Orbital Cellulitis

- Patients often look worse after initiating antibiotic therapy
  - Increased proptosis
  - Increased swelling
  - Larger abscess on CT
- Patients dehydrated on presentation, significant fluid load provided with IV antibiotics

Orbital Cellulitis Pearls

- Many patients with orbital cellulitis respond to medical therapy alone
- Assume antibiotic resistance until cultures prove otherwise
- Blood cultures are low yield; consider nasal swabs or sinus irrigation
- Aggressive nasal hygiene is integral
- Consider IV steroids
- Successful management may require surgical intervention if patient does not adequately respond to medical therapy

Chandler Classification of Orbital Cellulitis

- Stage 1 – Periorbital cellulitis
- Stage 2 – Orbital cellulitis
- Stage 3 – Subperiosteal abscess
- Stage 4 – Orbital abscess
- Stage 5 – Cavernous sinus thrombosis

Bacteriology SPA

- Streptococcus
- Staphylococcus (MRSA)
- Bacteroides
- Anaerobes in older patients

Antibiotic Therapy Orbital Cellulitis and SPA

- Cover staph, strep, anaerobes
- Recommendations vary widely
- Cefuroxime and clindamycin
- Cefuroxime as single agent

Medial Wall of Orbit

- Thinnest, 45-50 mm long
- Walls parallel to each other, 25 mm apart
- Maxillary, lacrimal, ethmoid, lesser wing of sphenoid
- Lacrimal sac fossa
- Anterior and posterior ethmoid foramina (horizontal cribiform plate)
Subperiosteal Abscess (SPA)

- Most along medial orbital wall
- Due to ethmoid sinusitis
- Spreads through thin medial wall through vascular channels, natural dehiscences
- Potential space between loose periosteum and bone
- Incidence about 15% of orbital infections

Common Location of Subperiosteal Abscess

- Medial wall most common
  - Ethmoid sinusitis is common
  - Lamina papyræa is the thinnest orbital wall
- Inferior orbit
  - Maxillary sinusitis
Less Common Location of Subperiosteal Abscess

- Superior orbit less common
  - Frontal sinus not aerated until later in childhood
  - Orbital roof is thicker
  - May be associated with intracranial involvement
- Lateral orbit - rare
  - No adjacent sinuses
  - May be inflammatory dacryoadenitis

Complications SPA

- Visual loss due to optic neuropathy
- Meningitis
- Cavernous sinus thrombosis
- Brain abscess

Indications for Surgery

- Depends on age of patient
- 9 years or younger, can be observed closely
- Older than 9 years require drainage
- Urgency depends on optic nerve status and condition of patient
Emergency Drainage of SPA

- Optic nerve function impaired
- Positive APD, visual loss
- Intracranial complications (meningitis, abscess)
- Retinal function impaired
SPA of Orbit – Age Factor

- <9 years, 83% cleared without drainage (25%) or had negative cultures at time of drainage (58%)
- 9-14 years showed transition to complex infections
- >15 years all had positive cultures after 3 days IV antibiotics, polymicrobial infections, anaerobes in all cases

Subperiosteal Abscess (9 Years or Less)
- May clear without surgical drainage
- When drained, often negative cultures
- Positive cultures for single aerobes

Subperiosteal Abscess (9-14 Years)
- Transition to more complex infections
- Require drainage
Subperiosteal Abscess (15 years or older)

- Mixed aerobic and anaerobic infections
- Refractory to IV antibiotics
- Require drainage
Urgent drainage SPA (within 24 hours)

- Large SPA
- Superior or inferior SPA
- 9 years of age or older
- SPA of dental origin, frontal sinusitis
Superior SPA

- Older children and young adults
- More dangerous subset of abscess
- Require urgent drainage
- Correlation between frontal sinusitis, superior SPA, and intracranial abscess
- 3/6 children in one study with superior SPA had intracranial abscess

ENT Consultation

- Orbit and sinuses usually drained simultaneously
- Medial SPA can often be drained endoscopically
- Prevention of recurrence

Surgical Approaches to SPA

- Modified Lynch along superior and medial orbital rim (most common)
- Lid crease
- Inferior orbital
- Transcaruncular
- Endoscopic endonasal
- Combined transcaruncular/endoscopic
Transcaruncular Drainage (SPA)
- Direct approach, easy visualization
- Excellent cosmetic outcome
- Can be combined with endoscopic ethmoid sinus drainage

Transcaruncular Approach to Orbit
- Used in orbital decompression, medial fractures
- Fast and easy access to medial orbital wall
- Disadvantage – unable to place orbital drain

- [Image of transcaruncular drainage]
- [Image of transcaruncular approach to orbit]
Endoscopic Drainage SPA

- Performed much more commonly recently
- Functional endoscopic drainage through nose
- General anesthesia
- Pack nose with oxymetazoline hydrochloride
- With or without ethmoidectomy

Advantages of Endoscopic Drainage SPA over External

- No skin incision and resultant scar
- Shorter hospital stay (4.3 days vs 6.3 days)
- Less edema
- Faster recovery

Disadvantages Endoscopic Drainage SPA

- Need experienced endoscopic surgeon
- Potential for poor visualization due to smaller anatomy pediatric nose, bleeding form acutely inflamed sinus mucosa
- Risk of damage to medial rectus muscle, optic nerve

Intraorbital Abscess

- Stage 4 orbital cellulitis
- Due to partially treated or neglected orbital cellulitis
- Can be endogeneous
- Drain using orbitotomy approach dependent on location of abscess
Orbital Cellulitis due to Endophthalmitis

- Pan-ophthalmitis due to endophthalmitis
- Must drain the abscess
- Usually only requires evisceration or enucleation of the eye
- Systemic antibiotics