Advanced ENT Imaging

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Objectives

• Review what studies to order for common clinical scenarios

• Demonstrate the appropriate use of CT, MRI, US and fluoroscopy to characterize ENT pathology

• Case based review of invasive sinus disease, neck masses, peritonsillar abscess, SSCD

Sinus Disease
Sinus Disease

- Inflammatory/Infectious
- Neoplasm and tumor-like
- Granulomatous Disease

Sinusitis

Indications for imaging:
- Not responding to treatment
- Clinical features concerning for complications
- Intracranial, Intra-orbital
- High risk patients
  - transplant, DM

What to order?
- Sinus CT
  - Routine – non-contrast
  - Contrast for periorbital or facial swelling, clinical suspicion for intracranial extension or abscess, failing treatment

42 y.o. male chronic sinusitis, left orbital pain & periorbital swelling
36 y.o. female with sinusitis clinically, severe headache worsening on antibiotics

Complications of Sinusitis

• Orbital and facial cellulitis
• Subperiosteal abscess
  – Pus between osseous orbital wall and periorbita
  – Common with ethmoid sinusitis
  – Represents 20% of orbital complications of sinusitis
• Epidural abscess
• Venous Occlusive Disease
• Brain Abscess
• Meningitis

19 y.o. male with supraorbital swelling and facial pain
19 y.o. male with supraorbital swelling and facial pain

Pott's Puffy Tumor

54 year old with sinus congestion and headaches
Odontogenic sinusitis

- Inflammation of maxillary sinus due to odontogenic inflammatory disease or violation of sinus during dental procedure

- Treatment:
  - Antibiotics
  - Extraction or endodontic treatment; oralantral fistula repair
  - Sinus surgery if ostium blocked

56 y.o. female h/o DM and renal transplant c/o facial pain and congestion
60 y.o. female h/o RA, recent sinusitis with new left diplopia and proptosis

Invasive Fungal Sinusitis

- Rapidly progressive fungal sinusitis involving bone & adjacent soft tissues; usually immunocompromised
- CT:
  - Soft tissue infiltration, focal bone erosion
  - Maxillary & ethmoid sinuses > sphenoid sinus
- MR:
  - Intraorbital & intracranial extension
  - Hemorrhagic infarcts, venous and arterial occlusive, pseudaneurysm
- Differential Diagnoses:
  - Acute rhinosinusitis with complication, Wegener’s granulomatosis, sinonasal malignancy
22 y.o. female afebrile with facial numbness

22 y.o. female afebrile with facial numbness

24 year old male nasal congestion

Allergic Fungal Sinusitis
- Chronic rhinosinusitis = eosinophilic mucin and noninvasive fungal hyphae
- Immunocompetent, allergy ± polyposis
Pharyngitis

- Uncomplicated viral or bacterial pharyngitis
- Tonsillitis
- Tonsillar, peritonsillar abscess
- Retropharyngeal abscess
- Epiglottitis
- Neoplasm
  - SCCA

Pharyngitis

- Indications for imaging:
  - Clinical features concerning for abscess, airway compromise, neoplasm
  - Not responding to treatment
  - High risk patients
- What to order?
  - Contrast enhanced neck CT
31 y.o. male with throat pain

29 y.o. with throat pain and fever

49 y.o. male with throat pain and fever
Tonsillar and Peritonsillar Abscess

- Confusing terminology
  - Abscess can be confined to palatine tonsil and peritonsillar space
  - Rupture into parapharyngeal, masticator or submandibular space
- CT: Enlarge tonsil with central low attenuation and peripheral rim enhancement
- DDx: Tonsillitis, retention cyst, neoplasm (SCCA)

4 y.o. female URI failure to thrive, fever

Retropharyngeal Abscess

Pediatric population
- Bacterial pharyngitis or OM-> suppurative adenitis retropharyngeal nodes-> rupture into retropharyngeal space
- Complications:
  - airway compromise
  - mediastinitis,
  - thrombophlebitis
48 y.o. hypopharynx SCCA, laryngopharyngectomy and radiation with dysphagia and pain

Palpable neck mass
Palpable neck mass

What to order?
• Ultrasound for suspected primary thyroid mass or mass in child
• MRI for primary parotid mass with facial nerve symptoms. CT or MRI for all other parotid lesions
• Contrast-enhanced neck CT for all other palpable or suspected neck masses in adult

29 y.o. female palpable rt neck mass and night sweats

DDx:
• Reactive
• Metastases
• Lymphoma
  (Hodgkin and Non-Hodgkin)
• PTLD
• Sarcoidosis

Hodgkin Lymphoma
• Neck or supraclavicular adenopathy
• Single nodal or adjacent nodal groups
• Mediastinal nodal involvement common
• 40% have fever, sweats, weight loss
45 year old female with noarseness and right neck mass

Vagal Schwannoma
- Painless palpable mass, +/- hoarse
- Posterior carotid space
- DDx: LN, paraganglioma

45 y.o. male with palpable right neck mass

Carotid Body Tumor
- Painless slow growing mass
- Arise from paraganglia
- Hypervascular mass splaying carotid bifurcation, bilateral

38 year old male palpable left neck mass
HPV Squamous Cell Carcinoma

- Oral HPV infection strongly associated with SCCA tonsil and BOT
- Younger, non smoker, new neck mass
- Better prognosis after chemoradiation
- Level IIA lymph node, necrotic or cystic. Primary tumor in the tonsil or BOT often small or occult on imaging and exam
- the diagnosis can be easily overlooked.

42 year old male palpable left neck mass

20 y.o. female palpable right neck mass female
Take Home Point: New cystic right or left neck mass in an adult is suspicious for cancer until proven otherwise.

53 y.o. asymptomatic fullness right oropharyngeal wall

Benign Mixed Tumor / Pleomorphic Adenoma

- Cheek mass or mass effect on oropharynx
- MRI - Very high T2 signal specific for BMT
- Malignant transformation
- DDX:
  - Warthin tumor
  - Metastatic intraparotid node
  - Adenoid cystic, mucocystic carcinoma
75 year old palpable right neck mass

ICA Pseudoaneurysm
- Pulsatile neck mass, cranial nerve palsy, TIA/Stroke
- Post-traumatic, atherosclerotic disease, CTD

Vertigo

- Peripheral
  - BPPV
  - Meniere
  - Vestibular neuritis
  - SCCD
  - Recurrent vestibulopathy

- Central
  - Brainstem ischemia
  - Wallenberg syndrome
  - Cerebellar infarct
  - MS
  - Chiari Malformation

What test to order? if acute onset, MRI. If SCCD suspected, temporal bone CT?
47 y.o. c/o dizziness with loud noises, hearing loss

Superior Semicircular Canal Dehiscence

Pöschl  Stenver
Superior Semicircular Canal Dehiscence

- Absent or markedly thin roof over SCC
- Tullio phenomenon - Vertigo ± nystagmus
- 3rd mobile window Canal response to sound & pressure in membranous labyrinth
- CT study of choice – standard coronal, Pöschl, Stenver
  - to sound

Otalgia

Primary Otalgia

- Otitis Media
- Otitis Externa
  - What to order and when?
    - Contrast enhanced CT
    - Poor or no response to Rx
    - Suspect extension to adjacent compartments
- Trauma
- Otologic tumors
  - SCCA, adenoCA
- Inflammatory
  - Relapsing polychondritis, bullous myringitis
75 y.o. male with otalgia & DM

Malignant or Necrotizing Otitis Externa
- Diabetes
- Immunosuppressed
- Pseudomonas
- DDx: EAC Cholesteatoma, SCCA

Another male with MOE & DM

77 y.o. male with otalgia & otorrhea

Coalescent Otomastoiditis
- Localized acidosis
- Osteoclastic resolution of mastoid septae
- Bezold abscess
- Epidural abscess
- Sigmoid sinus thrombosis
- Petrous apicitis
77 yr old male with otalgia & otorrhea

Bezold Abscess
- Dr Friedrich Bezold, German otologist
- Spread from tip of mastoid into SCM and posterior cervical and perivertebral spaces

65 y.o. male with ear pain, neck swelling

65 y.o. male with ear pain, neck swelling

Bezold Abscess, Epidural abscess, Venous sinus thrombosis
Sensorineural hearing loss

SNHL
- What to order and when?
- Presbyacusis
- Developmental
  - Enlarged vestibular aqueduct, labyrinthine dysplasias
- Tumors
  - Schwannoma, meningioma, ELS
- Infection/Inflammation
  - Vestibular neuritis, labyrinthitis, meningitis, post-radiation
- Trauma
- Primary bone-Paget’s, osteopetrosis
- Central-AICA infarcts, MS
- Other-Ototoxic drugs, autoimmune

22 y.o. female blunt trauma and new onset SNHL

Acute labyrinthitis ossificans
- Ossification in labyrinth after infection, trauma, surgery
- Bilateral SNHL in child after meningitis
7 year old with longstanding left SNHL

45 y.o. female with right SNHL

Vestibular Schwannoma
- Benign tumor, Schwann cells
- Unilateral sensorineural hearing loss

Conductive hearing Loss
Conductive hearing Loss

• Otitis media with effusion
• Cholesteatoma
• Ossicular chain disarticulation
• Otosclerosis
• Tympanosclerosis

• Cerumen or EAC debris
• Perforated tympanic membrane
• Foreign body
• Large exostoses, osteomas

What to order? Temporal bone CT

38 y.o. female painless otorrhea and conductive hearing loss rt ear

Acquired cholesteatoma
- Desquamated keratinized squamous cells
- Soft tissue mass in Prussak space with scutum & ossicle erosions

38 year old with chronic recurrent ear infections

Cholesteatoma
Chronic Otomastoiditis

32 y.o. male with left CHL

17 y.o. CHL after trauma

Tinnitus

Longitudinal capsule sparing fracture with Incudomalleolar dislocation
- Capsule sparing or violating
- FN
- Tegmen
- Carotid canal
- Ossicles
Tinnitus

- Ringing sensation in the setting of no external stimuli
- Objective/subjective; pulsatile/nonpulsatile
- Anatomic
  - Tumors
  - Vascular abnormalities
- Non anatomic
  - viral infection, drugs, high noise, systemic diseases
- What to Order?
  - Contrast enhanced CT and/or MRI

Pulsatile Tinnitus DDx

- Idiopathic
- ICA stenosis or dissection
- AVM/AVF
- Pseudotumor cerebri/venous stenosis
- Paragangliomas
- Aberrant ICA
- Persistent stapedial artery
- High jugular bulb/diverticulum

52 y.o. rt pulsatile tinnitus

Glomus Jugulotympanicum
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- Most common tumor with pulsatile tinnitus
- Benign hypervascular tumor of glomus bodies
  - Jugulotympanicum
  - Jugulare
  - Tympanicum

Glomus Jugulotympanicum

- Soft tissue mass on cochlear promontory
- Floor of middle ear normal (unlike glomus jugulare)
- Avid enhancement (unlike congenital cholesteatoma)
- Encases ossicles (unlike cholesteatoma)
- Red mass on otoscopy

Dr. Hemant Parmar, Univ of Michigan
47 y.o. female tinnitus

- Dural AVF
  - Acquired shunt between dural artery and dural sinus
  - Prognosis depends on location, venous drainage pattern

47 y.o. female h/o pulsatile tinnitus

12 y.o. left tinnitus

- ICA dehiscence
28 y.o. Rt pulsatile tinnitus

Dehiscence of Jugular bulb