Head and Neck Cancer I
Nasopharyngeal Cancer

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Disclosures
• None*

Objectives
• To briefly review the anatomy of the nasopharynx
• To discuss the epidemiology, staging, and imaging of nasopharyngeal cancer
• To recognize potential pitfalls related to imaging of nasopharyngeal cancer

Thank you
• To Dr. Gentry, the Program Committee, and all of you!

Nasopharynx
• Upper aspect of UADT
• Part of the pharyngeal mucosal space
• Contents:
  – Squamous epithelium
  – Lymphoid tissue
  – Minor salivary glands
  – Constrictor muscles
• Complex boundaries
  – Skull base/CVJ
  – Sphenoid sinus
  – Parapharyngeal space
• Complex anatomy
• Close proximity to vital structures

Pharyngobasilar Fascia
• Aponeurosis of superior pharyngeal constrictor muscle, influences NPC spread
  – Attaches to skull base medial to foramen ovale
  – Limits lateral growth, tends to direct tumor to SB
• Tumor may extend laterally via sinus of Morgagni
  – Gap in PBF through which LVP, Eustachian tube pass from skull base to PMS

Nasopharyngeal Cancer: Background
• NPC: a malignant epithelial carcinoma with distinct epidemiology, histology
  – Common form of cancer in southern China, SE Asia (20-60x)
  – Also common in native population of Arctic, Middle East, N. Africa
  – Uncommon in white population of United States
• Associated with EBV infection (98% of cases)
  – NPC cells express EBV latent proteins
  – Plasma EBV DNA levels can be used for monitoring
• In non-endemic regions, recognition of possible role for HPV
  – EBV, HPV infection typically mutually exclusive
  – EBV-associated NPC has best prognosis
  – HPV+ has intermediate prognosis
  – EBV-HPV+ tumors have worst prognosis

*Diagrams courtesy of Ric Harnsberger and Amirsys

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NPC: Background, continued

- Two major histological subtypes: non-keratinizing carcinoma (differentiated or undifferentiated) and keratinizing SCC
  - EBV is consistently associated with non-keratinizing NPC
  - Undifferentiated is the most common subtype, with the most favorable prognosis
- Clinical work-up
  - MRI of naso, skull base, neck
  - PET CT typically done
  - Baseline and posttreatment plasma EBV DNA levels to monitor response and recurrence

NPC: Clinical Presentation

- Neck mass
- Nasal obstruction/bleeding
- Hearing loss/otitis/otalgia
- Headache
- Cranial nerve palsy
- Occasionally incidental pick-up on physical exam or imaging study

Staging of NPC: T Stage

- T1: tumor confined to NP, or tumor extends to oropharynx and/or nasal cavity, without parapharyngeal extension (PPE)
- T2: Tumor with PPE; tumor may also involve medial/lateral pterygoid muscle, or prevertebral muscle
- T3: Tumor involves bony structures of skull base and/or paranasal sinuses
- T4: tumor with intracranial extension and/or involvement of CN’s, hypopharynx, orbit, or w extension to temporalis muscle, masseter muscle, or parotid gland

Staging of NPC: N Stage

- N0: no regional LN metastasis
- N1: Retropharyngeal: unilateral or bilateral, ≤6 cm
  - Cervical: unilateral, ≤6 cm, and above caudal border of cricoid cartilage (previously: above supraclavicular fossa)
- N2: Cervical: bilateral, ≤6 cm, and above caudal border of cricoid cartilage (previously: above supraclavicular fossa)
- N3: >6 cm and/or below caudal border of cricoid cartilage (regardless of laterality) (eliminates N3a, N3b)
M Staging

• Mets uncommon at time of initial dx (<10%, possibly <5%)
  – Overall incidence: ~30%
• Presence of distant metastasis at initial diagnosis has significantly shorter survival when compared to those with subsequent metastases
• Once metastasis is diagnosed, the overall survival of patients is very poor after palliative chemotherapy
• Lung, liver, bone are most common

46 M, Asian, p/w cough, found to have B LAN on physical exam. Further evaluation reveals a mass confined to L NP.

Dx: NPC, T stage is T1

43 M, Asian, p/w progressively enlarging neck masses, as well as R ear fullness and HA.

Dx: NPC, T stage is T2 for parapharyngeal extension.

34 M, Asian, presents w HA and R level 2 neck mass

R NP mass w skull base extension. T3 disease.

T4 disease: 48 year old Asian M w massive LAN. Also HA, L CN V, VI deficits

Potential for later diagnosis or misdiagnosis in children, teens

15 M, p/w epistaxis, though to have an angiofibroma, rx’d w embolization. Then biopsed for dx of rhabdomyosarcoma vs lymphoma vs NPC.

Pediatric NPC: ~2% of patients w NPC. Patients typically present w advanced stage disease but have superior outcome c/w adults.
A Not Uncommon Pitfall: NPC as an Incidental Finding

Post-Treatment Appearance

- Radiation +/- chemo is the mainstay of treatment
- Tumor mass should decrease, but NP may still be very abnormal
  - Early: edema and mucositis
  - Later: fibrosis and scarring
    - Effacement of lateral pharyngeal recesses, the “featureless” nasopharynx
- Signal abnormality may persist in soft tissues and bone marrow
  - If stable (granulation tissue, fibrosis), then usually OK
  - If progresses, think recurrence vs radionecrosis +/- infection

Small primary lesion, pre-rx and 6 months post-rx. Complete resolution of mass, return to nl appearance

Large primary lesion, pre-rx and 27 months post-rx. Persistently abnl appearance, but much improved and stable over multiple follow-up studies.

20 F rx’d for NPC. 15 years later, “featureless” nasopharynx due to scarring and fibrosis.

Patient being followed for acoustic neuroma and cerebellar cavernous malformation

“R/o chronic sinusits”

No comment on NP on sinus CT

Dx of NPC made 2 years post initial MR

Initial MR

Post rx inflammation, mucositis

15 yrs later. Fibrosis, obliteration of fossa of Rosenmüller.
Re-Treatment Options

- Recurrent locoregional disease may occur rapidly or after many years
- Re-irradiation (IMRT, SRS) +/- chemotherapy
- Surgery (+/- additional RT or chemo)
  - Nasopharyngectomy, other local resection
  - Neck dissection
- Chemotherapy alone
  - Palliative

Patient w h/o NPC, rx’d, doing well except for hearing loss from chemotherapy. For cochlear implant.

Nasopharyngectomy

- NPC is highly radiosensitive, and primary treatment is RT +/- chemotherapy
  - Local recurrence often rx’d w re-irradiation (IMRT, SRS), but this can be very damaging to soft tissues and bone
  - Surgery is a reasonable choice when the recurrent tumor is resectable*: less morbid than high-dose re-irradiation
    - Previously: open approaches (i.e. transpalatal, facial translocation) with potential for significant morbidity
    - Present: emergence of minimally invasive techniques such as endoscopic nasopharyngectomy

Rx-Related Complications

- Common
  - Pharyngeal fibrosis (chemorad)
  - Temporal lobe radionecrosis
    - Less common with IMRT*
  - RT-induced cranial nerve palsy
- Less common (though more common w longer survival times)
  - Osteoradionecrosis (skull base, mastoid, CVJ)
  - Osteomyelitis
  - Accelerated atherosclerosis/carotid stenosis
  - Radiation-induced malignancy

*Usually rT1, but may apply to selected rT2 or rT3 tumors

But see Zeng et al, Radiology, June 2015: high incidence of temporal lobe injury: 8.3% after IMRT
Young Asian F w NPC. B mastoid effusions. Eustachian tube extension?

55 M, rx’d 10 years ago for NPC, w progressive severe neck pain

Persistence/recurrence in R mastoid. Bone-eroding mass. Rx’d w SRS. 1.5 years later, severe radiation necrosis R temporal lobe.

Dx: osteoradionecrosis, rx’d w hyperbaric oxygen, surgical fusion

50 yr old Asian male, rx’d 15 yrs earlier for NPC. Now with HA, fever, swelling over L mastoid

Severe skull base ORN c/b osteomyelitis, mastoid abscess. Rx’d w surgical drainage, antibiotics, hyperbaric oxygen.

40 F, Asian, h/o NPC, w L hemisphere TIA.

Dx: L ICA stenosis due to prior high dose RT. Rx’d w carotid endarterectomy

62 M, Asian, rx’d 15 yrs earlier for NPC. Now with HA, multiple CN palsies

Dx: radiation-induced fibrosarcoma. Unresectable and unresponsive to re-irradiation

Potential Mimics of NPC

- Inflammatory
  - Adenoidal hypertrophy
  - Skull base osteomyelitis
- Non-neoplastic proliferative
  - IgG4-related disease
  - Sarcoi, LCH, etc
- Malignant neoplasm
  - Lymphoma
    - Also lymphoproliferative such as PTLD
  - Minor salivary gland tumors (ACC, MEC)
  - Rhabdomyosarcoma

Young adult with reactive adenoidal hypertrophy (symmetry, striations, homogeneity)
73 year old Asian woman with h/o AML complains of R ear pain and fullness. On exam, masses of the R EAC and NP are seen.

Ddx: chloroma, lymphoma, NPC, PTLD, infection (bacterial, atypical, fungal). An MR was performed.

MR: diffuse soft tissue and osseous abnormality w/o focal mass on T2WI.

Dx: group B strep infection, gradually better w antibiotics.

Warning: At first glance, SBO can mimic NPC, and NPC can mimic SBO. Be especially cautious in Asian patients. Consider both diagnoses as appropriate.

Two different patients with ACC

48 F w 3 yrs of progressive L CN V and VII dysfunction.

45 M w HA, ear pressure.

Dx: diffuse large B-cell lymphoma.

37 M, 3 mo nasal blockage not responsive to antibiotics or topical steroids.

Dx: diffuse large B-cell lymphoma.

5 yr old boy with HA, difficulty breathing.

Dx: rhabdomyosarcoma.

Summary

- Nasopharynx
  - Boundaries, contents
  - Expected appearance
- Pathology
  - Nasopharyngeal carcinoma
  - Epidemiology, staging
- Treatment
  - Post-rx appearance
  - Re-treatment options
- Potential mimics
  - Malignant and non-malignant processes

16 F, new dx of NPC. PET MR. Stay tuned!