**NI-RADS: Head & Neck Cancer Imaging Surveillance**

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**ACR – RADS (Reporting and Data Systems)**

- Standardized terminology, report organization, assessment classification
- LI-RADS, Lung-RADS, PI-RADS, C-RADS, O-RADS, TI-RADS, HI-RADS, NI-RADS

Most have binary outcomes: cancer or not

https://www.acr.org/Quality-Safety/RADS

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**Goals of the RADS templates:**

1. **Simplify communication**
   - Easily understandable
2. **Clearly direct management**
   - Numerical levels of suspicion & linked management
   - Multidisciplinary approach
   - It’s OK to be unsure of diagnosis, but need to be sure of the next step
3. **Facilitate rad-path correlation for QI**

**Master Radiologist Able to Hedge on Every Possible Medical Condition**

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**Goals:**

4. **Foster evidence based practice**
   - Data minable reports to study optimal surveillance algorithms, impact on patient outcomes, imaging accuracy, etc.
5. **Patient centered care**
   - Consensus for management steps opens avenues for direct patient reporting & highlights the radiologists’ added value

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**ACR NI-RADS**

*Neck Imaging, Reporting & Data System*

- To provide a validated template to guide management of neck masses in patients undergoing surveillance imaging for treated H & N cancer

https://www.acr.org/Quality-Safety/Resources/NIRADS
Multidisciplinary consensus: ENT surgery, radiation & medical oncology
4 levels of suspicion & linked management
To pave the way for direct patient reporting

ACR NI-RADS committee
1. Consensus for a revised risk stratification system and template: ACR NI-RADS
2. Lexicon to distinguish benign post tx vs residual/ recurrent disease for H&N cancer imaging surveillance

ACR- NI-RADS
Category 1 – No evidence of recurrence
Category 2 – Low suspicion of recurrence
Ill-defined, hypoenhancing, only mild FDG uptake
  2a: superficial
  2b: deep

Category 3 – High suspicion of recurrence
Discrete, new or enlarging, intense FDG uptake

Category 4 – Definitive recurrence
Path proven, clinical or radiographic progression

ACR NI-RADS

Surveillance Imaging
- 2015 NCCN guidelines: Imaging 6 months post-tx for T3 or T4 primary and N2 or N3 disease
- 2016 ACS H&N Cancer: “Routine imaging not recommended in the absence of clinical symptoms”
- AHNS education committee: “Do you know your guidelines?” survey
  - focus on “controversy”: surveillance imaging
  - 79% use PET/CT on asymptomatic patients

Surveillance Algorithm: Asymptomatic
At our centers, initial follow-up is 12 wks after surgery or completion of CRT
If negative 12 months
If negative 6 months
If negative 12 months

https://www.acr.org/Quality-Safety/Resources/NIRADS
FINDINGS:
- No evidence of recurrent disease is demonstrated at the primary site.
- No pathologically enlarged, necrotic, or otherwise abnormal lymph nodes.

Expected post-treatment changes are noted including supraglottic mucosal edema and thickening of the skin and subcutaneous soft tissues.

There are no findings to suggest a second primary in the imaged aerodigestive tract.

Evaluation of the visualized portions of brain, orbits, spine and lungs show no aggressive lesions suspicious for metastatic involvement.

IMPRESSION:
- Primary: Expected post-treatment changes in the neck without evidence of recurrent disease in the primary site
- Neck: No evidence of abnormal lymph nodes.

ACR NIRADS Template Legend

- **Primary**
  - 1: No evidence of recurrence: routine surveillance
  - 2: Low suspicion
    - a) Superficial abnormality (skin, mucosal surface): direct visual inspection
    - b) Ill-defined deep abnormality: short interval follow-up or PET
  - 3: High suspicion (new or enlarging discrete nodule/mass): biopsy
  - 4: Definitive recurrence (path proven or clinical progression): no biopsy needed

- **Nodes**
  - 1: No evidence of recurrence: routine surveillance
  - 2: Low suspicion (ill-defined): short interval follow-up or PET
  - 3: High suspicion (new or enlarging lymph node): biopsy if clinically needed
  - 4: Definitive recurrence (path proven or clinical progression): no biopsy needed

*Short interval follow-up: 3 months at our institution

A legend is included at the bottom of every NIRADS report

Allows interpretation by any clinician viewing the report with direct guidance based on category making NIRADS accessible to primary care and ENT alike

NIRADS 1 imaging features

- Expected post-treatment changes with non-mass like distortion of soft tissues, w/o significant FDG uptake

- **NI-RADS 1 lexicon**: low density "mucoid" submucosal edema, hypo-enhancing effacement of fat planes, linear diffuse mucosal enhancement

T1 N2c BOT SCCA, s/p CRT

Staging PET/CECT

3 month post-CRT PET/CECT

Primary: 1

Neck: 1

Routine surveillance, 6 mo CECT

T1N1 palatine tonsil SCCA s/p TORS & ND

Staging PET/CECT

3 month post-CRT PET/CECT

Primary: 1

Neck: 1

Routine surveillance, 6 mo CECT

T4a N2b FOM SCCA s/p resection, partial glossectomy, mandibulectomy & FFF recon

Primary: 1

Routine surveillance, 6 mo CECT
1. Tongue fasciculations after partial glossectomy
2. Diffuse mucosal C+ =mucositis (NIRADS 1), focal mucosal C+ =tumor or radiation injury (NIRADS 2)
3. Muscular portion of flap will have differential C+ & shouldn’t be confused w/ tumor.

NIRADS 1: Pearls & pitfalls

- Low suspicion ill-defined soft tissue with only mild differential C+, no discrete nodule/ mass, mild FDG
- **NIRADS 2 lexicon**: focal mucosal C+ or FDG w/o a discrete nodule, residual nodal tissue w/ mild FDG or growing node w/o morphologically abnormal features
- Mismatch between CECT and PET

Primary:
- a) Mucosal surface→ direct visual inspection
- b) Deep→ short interval F/U (3 months) or PET (if CECT alone)

T4a BOT SCCA s/p CRT

Primary: 2a

Direct inspection: radiation injury, f/u PET neg

T2N0 glottic SCCA s/p CRT 2011, intermittent f/u and now hoarseness

Primary: 2a

Endoscopic biopsy: SCCA recurrence

NIRADS 2: Pearls & pitfalls

1. Work backwards, considering “do I want to biopsy this now (NIRADS 3) or would it be prudent to wait 3 months and re-image (NIRADS 2)?”
2. In most cases, waiting for 3 months will NOT change the options (radionecrosis vs tumor an exception)
3. **NIRADS 2a** = special category for mucosal dz bc surgeons can easily look
   - PET esp. helpful in post-radiated larynx to direct clinical inspection
**NIRADS 3 Imaging features**

- **High suspicion discrete nodule or mass**
- **NI-RADS 3 lexicon**: Intense differential C+ from surrounding soft tissues, intense FDG uptake, morphologically abnormal (necrosis / ENE) or growing node w/ intense FDG uptake
- **CECT & PET matched suspicion/ concordant**

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**Maxillary SCCA s/p maxillectomy & exenteration**

- Primary: 3
- 4 month post resection & CRT PET/CECT
- CT biopsy - persistent SCCA

**T4aN0 larynx SCCA s/p TL, BL ND & CRT**

- Primary: 3
- Endoscopic biopsy - recurrent SCCA

**27 y/o s/p resection L nasal rhabdomyosarcoma**

- Neck: 3
- CT biopsy - recurrent alveolar rhabdomyosarcoma

**Angiosarcoma of the scalp**

- Neck: 3
- US biopsy - recurrent angiosarcoma

**T4aN1 SCCA tonsil s/p CRT**

- Staging PET/CECT
- 3 month post-CRT PET/CECT
- Primary: 3
- CT biopsy - inflammation, necrosis F/u Pt 1 decreased uptake
Radiation injury to soft tissue or bone can be tumefactive & mimic tumor, ie false positive

Don’t call a NIRADS 3 unless you are willing to biopsy

Work backwards, considering “do referring clinicians need biopsy (NIRADS 3) for the next tx stage or is imaging definitive (NIRADS 4)?”

NIRADS 3: Pearls & pitfalls

NIRADS: Initial Performance*

618 total sites (primary + nodes)

NI-RADS 1 85.4% (528)
NI-RADS 2 9.4% (58)
NI-RADS 3 5.2% (32)

Positive residual/recurrence rate
3.8% (20)
17.2% (18)
53.4% (19)

*Kreiger et al. Initial Performance of NI-RADS to Predict Residual or Recurrent Head and Neck Squamous Cell Carcinoma. AJNR 2017

Summary

NI-RADS adds value to reporting of H&N cancer imaging

Many opportunities to improve reporting:
1. Identify areas with challenging communication
2. Talk to referring clinicians & patients
3. Look for any data on best practices
4. Develop consensus management steps

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References