NI-RADS: Structured Reporting for Head and Neck Cancer

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Disclosures
• Part of group that initiated NI-RADS
• Colleagues A. Aiken & P. Hudgins:
  • ACR NIRADS committee members

Outline
• ACR-RADS
• Story of NI-RADS ➔ ACR NI-RADS
• Resources
• Cases & practical application
• Initial data

ACR –RADS (Reporting and Data Systems)
• Standardized terminology, report organization, assessment classification
• Most have binary outcomes: cancer or not
• Linked management – actionable reports

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

ACR NI-RADS committee
To provide a validated template to report findings & guide management in H&N cancer surveillance imaging:

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

https://www.acr.org/Quality-Safety/Resources/NIRADS
ACR- NI-RADS

Category 0 – New baseline, priors pending

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

*NIRADS 1

NIRADS 2

NIRADS 3

NIRADS 4

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.

IMPRESSION:
Primary: \[1\]. No evidence of recurrent disease in the primary site

Neck: \[1\], No evidence of abnormal lymph nodes.

ACR NI-RADS Template

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 0 imaging features

• New baseline study without any prior imaging available
   AND knowledge that prior imaging exists and will become available as comparison*

• Assign score in addendum after prior imaging examinations become available

• Found this to be helpful for complicated post treatment cases, esp MRI
T1 N1 right BOT s/p CRT 8/16

Baseline prior in the same patient

Primary: 1  Neck: 0

Primary: 1  Neck: 1

NIRADS 1 imaging features

- Expected post-treatment changes with non-mass like distortion of soft tissues
- **NI-RADS 1 lexicon:**
  - CECT: low density submucosal edema, hypo-enhancing effacement of fat planes, linear diffuse mucosal enhancement, nodal tissue with no FDG
  - PET: no significant FDG uptake

T1 N2c BOT SCCA, s/p CRT

Primary: 1  Neck: 1

Routine surveillance, 6 mo CECT

T1N1 GTS SCCA s/p TORS & ND

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. Postop changes can be confusing: Review surgical & pathology reports
2. Tongue fasciculations after partial glossectomy
3. Diffuse mucosal C+ = mucositis (NIRADS 1), focal mucosal C+ = tumor or radiation injury (NIRADS 2)

NIRADS 1: Pearls & pitfalls

NIRADS 2 imaging features

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

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
- 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:**
  - CECT: intense differential C+ from surrounding soft tissues, morphologically abnormal node (necrosis / ENE)
  - PET: Intense FDG uptake, growing node w/ intense FDG uptake
  - CECT & PET matched suspicion/ concordant
Maxillary SCCA s/p maxillectomy & exenteration

4 month post resection & CRT PET/CECT

CT biopsy - persistent SCCA

Primary: 3

T4aN0 larynx SCCA s/p TL, BL ND, XRT

Endoscopic biopsy - recurrent SCCA

Primary: 3

Angiosarcoma of the scalp

12 months
18 months

US biopsy - recurrent angiosarcoma

Neck: 3

T4aN1 SCCA tonsil s/p CRT

Staging PET/CECT
3 month post-CRT PET/CECT

Biopsy - inflammation, necrosis
F/u PET decreased uptake

Primary: 3

NIRADS 3: Pearls & pitfalls

- Radiation injury to soft tissue or bone can be tumefactive & mimic tumor, ie false positive
- Generally - call NIRADS 3 when willing to biopsy

T4aN2c SCCA larynx s/p TL & NDs, exam c/f recurrence at stoma

Biopsy proven disease
Definitive clinical/radiographic progression of dz

Neck: 4
Positive residual/recurrence rate

3.8% (20) 47.5% (10) 50.4% (10)

Summary: NI-RADS adds value in H&N cancer surveillance imaging

1. Simplify communication
2. Clearly direct management
   • It’s OK to be unsure of diagnosis, but need to be sure of the next step
3. Facilitate rad-path correlation for QI
4. Foster evidence based practice
5. Patient centered care
   • “Putting Patients First: Emory Radiology” ACR 8/2017

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

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NI-RADS 1
85.4% (528)

NI-RADS 2
9.4% (58)

NI-RADS 3
5.2% (32)

618 total sites (primary + nodes)