Neck Management in Head and Neck Cancer: History and Current Practice

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Current HNC Stats

- Worldwide 6th most common cancer\(^1,2\)
- Advanced stage, III or IV, in 66%\(^1\)
- Neck mets
  - Significant poor prognostic indicator

\(^1\)Jemal 2009&2007, \(^2\)Shiboski2005
Chemoradiation Therapy for Advanced H&N Cancer

- Effective at controlling primary disease
- “Organ Preservation”
- Evolving confidence in its ability to treat neck disease

1 Rabalais2009; 2 Ong2008; 3 Wang2009
Neck Management in HNC

Outline

- History
- Neck dissection classification
- Current Practice
  - Controversies
  - DFCI experience
- Neck management recommendations
History Neck Management

- 460 BC: Hippocrates
  - “Carcinoma”

- 1600-1700’s:
  - Observation - Cancer spread local, regional and general circulation
  - Treatment - topicals, bleeding, purging, cauterization & limited resections
  - Neck mets = incurable
1800’s: Dawn of Scientific Medicine

- 1838: Microscopic pathology, Müller
- 1846: Anesthesia, William Morton
- 1867: Antisepsis
George Crile, Neck Dissection
Cleveland, 1906¹,²

¹Crile JAMA 1906
²Ferlito. Neck Dissection, 2010
Important Inventions/Innovations

- 1898: Radiation Therapy, Marie Curie
- 1918-1939: Between WWI & WWII
  - Primary radiation for HNC
Important Inventions/Innovations

- 1938: Antibiotics, Alexander Fleming
- 1940-50’s:
  - Blood transfusion
  - Improved anesthesia, critical care
Hayes Martin, Radical Neck Dissection

- Dissect
  - Levels I – V
- Sacrifice
  - CNXI
  - IJ
  - SCM
- Indications
  - All N+

1Cancer, 1951
Modified Radical Neck Dissection

- 1963 Suarez\(^1\); 1966 Boca\(^2\)
- Dissect
  - Levels I-V
- Preserve \(\geq 1\)
  - CNXI
  - IJ
  - SCM

\(^1\)Rev Otorrinolaringol; \(^2\)J Laryngol Otol
Modified Radical Neck Dissection

- **Indications**
  - **N+ neck**
    - Without invasion of SCM, IJV or CN 11
  - **N0 neck**
    - Elective neck mgmt
  - **Bilateral neck dissections**
Patterns of Nodal Spread

1972: Lindberg\(^1\)
- 2,044 CNDs

1990: Shah\(^2\)
- 1,100 CNDs

\(^1\)Cancer; \(^2\)Am J Surg
Neck Levels

• Oral Cavity
  I, II, III
• OP, Larynx, HP
  II, III, IV
Selective Neck Dissection

- 1988: Byers\(^1\)
- Dissect
  - Preserve at least one neck levels
- Indications
  - Elective
    - Prophylactic, Staging
  - Therapeutic
    - N1, early N2

\(^1\) Head & Neck Surg
Selective Neck Dissection
Level I, II, III

- Supraomohyoid ND
- Indications
  - OC
Selective Neck Dissection
Levels II, III, IV

- Lateral ND
- Indications
  - OP
  - Larynx
  - HP
History Neck Management

RT &/or Surgery

1950 – 1980:
- Improvements in RT and surgery
- Stage I or II: Surgery or RT
- Stage III or IV: Surgery & RT

1986 Mendenhall¹
- ND p RT = N1 PR & N2, N3

¹Int J Rad Onc Biol Phys
Combined Modality Treatment Advanced HNC

- 1991 VA Study\(^1\): Induction CRT
  - Assess neck p 2\(^{nd}\) cycle, ND @ 3mo for PR

- Presently: Induction or concurrent CRT
  - Planned ND or
  - ND for PR

\(^1\) N Engl J Med
Current Neck Management p CRT

Controversies

1. Who should get ND?
   - Planned vs. PR

2. Neck assessment
   - CT, PET/CT
   - Optimal timing

3. Neck dissection timing and morbidity

4. Type of neck dissection
1. Who Should Get ND p CRT?

- Planned – all PR, all N2 & N3\textsuperscript{1,2,3}
  - Tradition
    - Mendenhall p RT ND mgmt
    - Early trials lower dose neck RT
  - Neck assessments inaccurate
    - Early trials often relied on PE
  - Later neck salvage difficult
  - Still consider for all N3?

1. Who Should Get ND p CRT?

- Neck PR patients only
  - Assessments accurate\textsuperscript{1,2,3,4}
  - No improved control/survival when CR neck undergoes ND\textsuperscript{1,2}
  - ND morbid

1. Who Should Get ND p CRT? DFCI Experience

- 1993 Norris, Busse, Clark\textsuperscript{1}
  - N+ CR p induction predicts neck response and ND may not be needed

- 2006 Goguen et al\textsuperscript{2}
  - NPV 100\% when PE, CT and PET all CR
  - No improvement survival with ND in CR pt
  - ND not needed for CR pts

\textsuperscript{1}\textit{Semin Surg Oncol}; \textsuperscript{2}\textit{Arch Otolaryngol}
2. Neck Assessment p CRT

- **CT accuracy**\(^1,2,3\)
  - CT NPV 94-97\% at 4-12 wks
  - Neck relapse 0-5\%

- **PET/CT accuracy**\(^4-9\)
  - PET or PET/CT NPV 97-100\% at 12-16 wks
  - Neck relapse 0-3\%

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\(^1\) Yeung 2008; \(^2\) Forest 2006; \(^3\) Liauw 2006; \(^4\) Rabalais 2009; \(^5\) Ong 2008; \(^6\) Wang 2009; \(^7\) Nayak 2007; \(^8\) Porceddu 2005; \(^9\) Yao 2007
2. Neck Assessment p CRT
DFCI Experience

- Study in progress:
  - Neg CT predicts neg path at ND
    - NPV CT 95% (110 heminecks)
      - N2 NPV 97% (false neg 1/34; 85 N2)
      - N3 NPV 86% (false neg 1/7; 17 N3)
2. Neck Assessment p CRT

**Timing**

- Early PET/CT inaccurate\(^1,2\)
  - False positive
    - Treatment related inflammation
    - Cancer cells in evolution toward death
  - False negative
    - Small pockets of residual cancer, need to repopulate further to be detectable

- PET/CT more accurate at 3 mo p CRT\(^1,2,3,4,5,6\)

\(^1\)Porceddu; \(^2\)Yao2007; \(^3\)Rabalais2009; \(^4\)Ong2008; \(^5\)Wang2009; \(^6\)Nayak2007
3. Neck Dissection Timing and Morbidity

- **Timing Conflict**
  - PET/CT at 3 months
  - “Safe Surgical Window” 4-12 weeks post CRT

  - After acute CRT toxicities resolved
  - Before radiation related fibrosis

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1 Grabenbauer2003; 2 Vedrine2008; 3 Stenson2000
3. ND Timing and Morbidity
DFCI Experience

- **Study in progress:**
  - Can ND be safely delayed until $\geq 12$ wks?
  - Are complications increased?
  - Does regional control or survival decrease?
### ND Complications p CRT

<table>
<thead>
<tr>
<th></th>
<th>&lt;12Week ND (67pts)</th>
<th>≥12Week ND (38pts)</th>
<th>P-Value</th>
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</thead>
<tbody>
<tr>
<td>Major Wound</td>
<td>12%</td>
<td>3%</td>
<td>0.15</td>
</tr>
<tr>
<td>Minor Wound</td>
<td>16%</td>
<td>11%</td>
<td>0.56</td>
</tr>
<tr>
<td>Airway</td>
<td>10%</td>
<td>5%</td>
<td>0.48</td>
</tr>
<tr>
<td>Systemic</td>
<td>13%</td>
<td>5%</td>
<td>0.32</td>
</tr>
</tbody>
</table>
ND $\geq$ 12 Weeks p CRT

- No increased complications
- No diminished regional control or survival
4. Type of ND p CRT

- **CND**
  - RND or MRND

- **SND**\(^1,2,3,4,5,6\)
  - Based on primary, pre & post CRT imaging

- **Superselective ND, Robbins\(^4\)**
  - ≤2 neck levels
  - Planned ND or PR neck @ only one level by imaging

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\(^1\)Yeung2008; \(^2\)Rao2008; \(^3\)Doweck2003; \(^4\)Robbins 2005; \(^5\)vanderPutten2009; \(^6\)Mukhija2009
4. Type of Neck Dissection
DFCI Experience

- Study in progress:
  - CT as roadmap for designing SND or SSND
  - NPV per neck level I – V = 96 - 100%
Ability of More Limited Neck Surgery to Capture Neck Disease

CT PR $\leq$ 2 positive levels, 67 heminecks
SND captures 94%
SSND 91%

CT PR 1 positive level, 55 heminecks
SND captures 95%
SSND 93%

CT PR 1 positive LN, 52 heminecks
LN biopsy captures 90%
4. Type of ND DFCI Experience

CT Roadmap for Neck Surgery after CRT

- CT PR > 2 neck levels or ECS
  - CND
- CT PR 1 neck level
  - SND
- LN biopsy alone not safe
Conclusion
Recommendations

Neck Management p CRT

- CRT highly effective at treating neck mets\textsuperscript{1,2,3}
- CT and PET/CT 12 weeks p CRT
  - Safe to perform ND $\geq$12 weeks

Recommendations

Neck Management p CRT

- Neck CR
  - Observation
  - Repeat PET/CT at 6mo p CRT

- Neck PR – ND
  - Limited disease - SND
    - Usually levels II, III, IV
  - >2 levels or ECS - CND