Oropharyngeal Squamous Cell Carcinoma

Conventional and Modern Concepts

Viet Pham, MD
Faculty Advisor: Susan McCammon, MD
November 30, 2011
Oropharyngeal Squamous Cell Carcinoma:
Conventional and Modern Concepts

Viet Pham, MD
Faculty Advisor: Susan McCammon, MD
The University of Texas Medical Branch (UTMB Health)
Department of Otolaryngology
Grand Rounds Presentation
November 30, 2011
Outline

- Anatomy
- Oropharyngeal cancer
- Human papillomavirus
- Staging
- Treatment
- Conclusions
Anatomy

Oropharynx

- Soft palate
- Tonsillar fossae
- Base of tongue
- Oropharyngeal walls
- Vallecula
Anatomy Boundaries

- Superior
- Anterior
- Lateral
- Posterior
- Inferior

(Netter 2003)
Anatomy
Boundaries

- Superior
  - Hard palate
- Anterior
- Lateral
- Posterior
- Inferior
Anatomy Boundaries

- Superior
- Oropharyngeal isthmus
- Palatoglossal arch
- Anterior
- Lateral
- Posterior
- Inferior

(Netter 2003)
Anatomy
Boundaries

- Superior
  - Palatopharyngeal arch
  - Palatine tonsil

- Anterior

- Lateral

- Posterior

- Inferior

(Netter 2003)
Anatomy Boundaries

- Superior
  - Second and third cervical vertebrae
- Anterior
- Lateral
- Posterior
- Inferior

(Netter 2003)
Anatomy Boundaries

- Superior
  - Level of hyoid
- Anterior
  - Vallecula
- Lateral
- Posterior
- Inferior

(Netter 2003)
Anatomy

Soft Palate

- Tensor veli palatini
- Levator veli palatini
- Uvular
- Palatoglossus
- Palatopharyngeus
Anatomy

Soft Palate

- Epithelium
  - Ciliated columnar, nasal surface
  - Stratified squamous, oral surface
- Taste buds on oral surface
- Palatine aponeurosis
  - Anterior third of soft palate
  - Expanded tendons of tensor veli palatini
  - Attachment of palatine muscles except musculus uvulae

(Netter 2003)
Anatomy

Soft Palate Vascular Supply

- Ascending palatine branch (APA) of facial artery
- Occasionally ascending pharyngeal artery (APhA)
- Venous drainage via pterygoid venous plexus

(Netter 2003)
Anatomy

Soft Palate Innervation

- Maxillary nerve $\rightarrow$ lesser palatine nerve
  - Greater petrosal nerve without synapsing in pterygopalatine ganglion $\rightarrow$ taste
  - Postganglionic branches from pterygopalatine ganglion $\rightarrow$ secretomotor

- Glossopharyngeal nerve $\rightarrow$ branches
  - Posterior part of soft palate
  - Lesser petrosal nerve $\rightarrow$ otic ganglion $\rightarrow$ parasympathetic secretomotor

- Postganglionic sympathetics from carotid plexus
Maxillary nerve → lesser palatine nerve
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Postganglionic sympathetics from carotid plexus

(Cleft Palate Craniofac J 2005; 42:495-500)
Anatomy
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(Cleft Palate Craniofac J 2005; 42:495-500)
**Anatomy**

**Palatine Tonsil**

- **Anterior arch**
  - Palatoglossal fold
  - Palatoglossus muscle

- **Posterior arch**
  - Palatopharyngeal fold
  - Palatopharyngeus muscle

- **Lateral border**
  - Superior constrictor
  - Styloglossus
  - Anterior fibers of palatopharyngeus

*(Gray's Anatomy 2008)*
Anatomy

Palatine Tonsil Vascular Supply

- Vascular supply from external carotid artery
- Lower pole
  - Tonsillar artery, branch of facial (sometimes ascending palatine) artery
  - Dorsal lingual branch of lingual artery
  - Branch of ascending palatine artery
- Upper pole
  - Ascending pharyngeal artery
  - Descending palatine artery
    - Greater palatine artery
    - Lesser palatine artery

Tonsillar artery sometimes branches from ascending palatine artery

(Gray's Anatomy 2008)
Anatomy

Palatine Tonsil Innervation

- Tonsillar plexus ("circulus tonsillaris")
  - Maxillary nerve
    - Passes through (not synapses) sphenopalatine ganglion
    - Distribute via lesser palatine nerves
  - Tonsillar branches from glossopharyngeal nerve
- Referred otalgia from tympanic branch of glossopharyngeal nerve (Jacobson’s nerve)
Anatomy
Pharyngeal Wall

- Mucosa
- Submucosa
- Pharyngobasilar fascia
- Constrictor muscles
  - Superior constrictor
  - Upper fibers of middle constrictor
- Buccopharyngeal facia
**Anatomy**

**Pharyngeal Wall**

- **Pharyngeal plexus**
  - Pharyngeal branches of glossopharyngeal and vagus nerves
  - Innervation for constrictor muscles

- **Vascular supply**
  - Pharyngeal branch of ascending pharyngeal artery
  - Tonsillar branch of facial artery

(Netter 2003)
Anatomy

Base of Tongue

- Circumvallate papillae (anteriorly)
- Pharyngoepiglottic fold (posteriorly)
- Glossoepiglottic fold (posteriorly)
- Lingual tonsils are lateral

(Gray's Anatomy 2008)
Anatomy

Base of Tongue

- Glossopharyngeal nerve
  - Posterior third of tongue
  - Sensation and taste
- Vagus nerve
  - Internal laryngeal branch
  - Vallecula
- Lingual artery is main supply
Oropharyngeal Cancer

Epidemiology

- Relatively uncommon
  - Fewer than 1% of all new cancers
  - Comprises 10-12% of head and neck malignancies
- Squamous cell carcinoma (SCCA) accounts for 90% of oropharyngeal malignancies
  - Peak incidence in 6th or 7th decades of life
  - Tobacco and alcohol are synergistic risk factors
  - Increasing incidence in 4th and 5th decades of life
Oropharyngeal Cancer

Epidemiology

- **Changing demographics**
  - Younger adults, equal gender distribution
  - Good performance status
  - Nonsmokers, but possible association with marijuana use
  - Orogenital sexual practices

- **Increasing trend over past three decades**
  - Review of SEER database from 1975 through 2006 (Mehta 2010)
  - Well-differentiated tumors
    - Decrease in incidence (33% to 16%)
    - Five-year survival rates improved by 15.5%
  - Poorly-differentiated tumors
    - Increase in incidence (23% to 34%)
    - Five-year survival rates improved by 57%
Oropharyngeal Cancer
Human Papilloma Virus (HPV)

- High-risk HPV, type 16
  - Types 16 and 18 involved with cancer of genital tract
  - Associated with 45-70% of oropharyngeal SCCA (Cohen 2011)

- Integration of genome into host cell nucleus
  - Express E6 and E7 oncoproteins
  - Inactivate tumor-suppressant p53 and retinoblastoma protein
  - Associated with p16-positivity

- Histology
  - Predominantly poorly differentiated SCCA
  - Basaloid background
  - Correlated with HPV- and p16-positivity (Mendelsohn 2010)
    - No increase in lymphovascular or perineural invasion
    - Highly predictive of lymph node metastasis
Oropharyngeal Cancer
Human Papilloma Virus (HPV)

- Retrospective review of oropharyngeal SCCA (Ang 2010)
  - HPV-positive in 206 out of 323 with stage III or IV disease (63.8%)
    - Improved 3-year overall survival (82.4% vs. 57.1%)
    - Improved 3-year progression-free survival (73.7% vs. 43.4%)
    - HPV-positive conveys 58% reduction in death
  - One-percent increase in death or relapse for each pack-year of smoking regardless of HPV status

- HPV-positivity is favorable prognostic factor (Ihloff 2010)
  - Meta-analysis of 8 studies between 2000 and 2010
  - HPV-positive tumors generally respond well to treatment

- Advanced primary associated with recurrence and death (Sedaghat 2009)

- Studies needed to investigate impact of HPV vaccinations
Oropharyngeal Cancer

Lymphatic Drainage

- Levels II, III, and IV most common
- Retropharyngeal
  - Posterior pharyngeal wall
  - Palatine tonsil
- Bilateral drainage
  - Tongue base
  - Soft palate
  - Posterior pharyngeal wall
Oropharyngeal Cancer
Lymphatic Drainage

- Levels II, III, and IV most common
- Retropharyngeal
  - Posterior pharyngeal wall
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- Bilateral drainage
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When would you be worried about bilateral neck disease?
--Randal Weber, MD

When I feel nodes on both sides.
--Me
Oropharyngeal Cancer
Symptomatology

- Pain
- Dysphagia
- Otalgia
- Neck mass
- Foreign body sensation
- Hemoptysis
- Weight loss
- Voice changes
Oropharyngeal Cancer Staging

- Based on American Joint Committee on Cancer (AJCC)
- T, tumor
- N, node
- M, metastasis
Oropharyngeal Cancer

Staging

- **T**, tumor
  - **Tx**: primary site cannot be evaluated
  - **T0**: no evidence of carcinoma
  - **Tis**: carcinoma in-situ
  - **T1**: tumor < 2cm in greatest dimension
  - **T2**: tumor 2-4cm in greatest dimension
  - **T3**: tumor > 4cm in greatest dimension
  - **T4**
    - **T4a**: invades larynx, deep/extrinsic tongue muscles, medial pterygoid, hard palate, or mandible
    - **T4b**: invades lateral pterygoid, pterygoid plates, lateral nasopharynx, skull base, or carotid

- **N**, node

- **M**, metastasis
Oropharyngeal Cancer Staging

- **Tx**: primary site cannot be evaluated
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Invasion of pre-epiglottic fat (i.e. laryngeal involvement)

Invasion of medial pterygoid muscle

(Radiographics 2011; 31:339-54)
Oropharyngeal Cancer Staging

- **T**, tumor
  - **T**x: primary site cannot be evaluated
  - **T**0: no evidence of carcinoma
  - **T**is: carcinoma in situ
  - **T**1: tumor < 2cm in greatest dimension
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- **N**, node
- **M**, metastasis

*Image of encasement of carotid artery and involvement of foramen ovale.*

*(Radiographics 2011; 31:339-54)*
Oropharyngeal Cancer Staging

- T, tumor
- N, node
- M, metastasis

- Nx: lymph nodes cannot be evaluated
- N0: no evidence of nodal metastasis
- N1: single node involved, ≤ 3cm
- N2
  - N2a: single node involved, 3-6cm
  - N2b: multiple nodes involved unilaterally, ≤ 6cm
  - N2c: bilateral nodal involvement, ≤ 6cm
- N3: nodal involvement > 6cm
Oropharyngeal Cancer

Staging

- T, tumor
- N, node
- M, metastasis
  - Mx: distant metastasis cannot be evaluated
  - M0: no distant metastasis
  - M1: distant metastasis present
# Oropharyngeal Cancer Staging

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## Relative Five-Year Survival

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Oropharyngeal Cancer Staging

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Relative Five-Year Survival

- Stage I: 56.0%
- Stage II: 58.3%
- Stage III: 55.4%
- Stage IV: 43.4%

(AJCC 2006)
# Oropharyngeal Cancer Staging

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(Images: [Oropharynx](http://www.cancer.net), [AJCC 2006](http://seer.cancer.gov))
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(Seer.cancer.gov)

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(AJCC 2006)
Oropharyngeal Cancer

Treatment

- Surgery and radiotherapy (XRT) considered mainstays of treatment

Chemotherapy (CTX)
- Combined with XRT (CXRT)
- Organ preservation strategies
- Good local and regional control rates
- Meta-analysis (Blanchard 2011)
  - 87 randomized trials between 1965 and 2000
  - Improved overall and disease-free survival with CTX
  - Concomitant CTX more favorable than adjuvant or neoadjuvant CTX
  - Applies to all head and neck SCCA, but statistical significance in oropharynx and larynx
Oropharyngeal Cancer

Treatment

- Primary tumor
  - T1 and T2: surgery or XRT
  - T3 and T4
    - CXRT
    - Surgery with postoperative XRT (postop XRT)

- Neck
  - N0 and N1: surgery or XRT
  - N2 and N3
    - Surgery with postop XRT
    - CXRT and planned neck dissection
Oropharyngeal Cancer Treatment

- Treat both necks for central lesions
- Address retropharyngeal nodes
- Occult lymph node metastasis up to 35%
- XRT with surgical salvage
  - Fein (Fein 1996)
    - Five-year local and locoregional control 78% and 76%, respectively
    - Five-year overall survival 44%
  - Parsons (Parsons 2002)

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<th>5-Year Results</th>
<th>Locoregional Control</th>
<th>Disease-Free Survival</th>
<th>Overall Survival</th>
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<tr>
<td>Base of Tongue</td>
<td>60-69%</td>
<td>62-63%</td>
<td>49-52%</td>
</tr>
<tr>
<td>Tonsillar</td>
<td>65-69%</td>
<td>57-59%</td>
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(Vartanian 2003)
NOTES: (Baileys) All patients with oropharyngeal SCC more extensive than T1 require some treatment of the neck because of the high rate of clinically positive nodes and occult nodal metastasis at presentation. The choice of initial treatment modality (surgery or radiation) for the neck and retropharyngeal nodes is usually dictated by that used for the primary tumor. Stage N0 and N1 neck disease are effectively controlled with a single modality, but neck dissection has the added benefit of providing pathologic staging. The use of selective neck dissection in ruling out regional spread following transoral excision of the primary is not as reliable in oropharyngeal cancer as in oral cancer. This is due to the less predictable lymphatic pathways and the increased difficulty accessing the retropharyngeal nodes. For this reason, radiotherapy is often used even when the primary is treated surgically. Combined modality results in better regional control in stage N2 and N3 neck disease.
Oropharyngeal Cancer

Indications for Postop XRT

- Primary tumor
  - Close or positive surgical margins
  - Perineural or vascular invasion
  - Advanced T stage

- Neck
  - Clinically N0 or N1
    - > 2 positive nodes
    - Positive nodes at multiple sites
    - Perineural or vascular invasion
    - Extracapsular spread
  - N2 or N3 neck disease
Oropharyngeal Cancer
Chemotherapy

- EORTC trial (Bernier 2004)
  - 334 patients with stage III or IV SCCA from 1994-2000
    - 30% Oropharynx
    - 26% Oral cavity
    - 22% Larynx
    - 20% Hypopharynx
  - Compare adjuvant XRT versus adjuvant CXRT using cisplatin

- Five-year results

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<th>Overall Survival</th>
<th>Locoregional Relapse</th>
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<tr>
<td>XRT</td>
<td>36%</td>
<td>40%</td>
<td>31%</td>
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<tr>
<td>CXRT</td>
<td>47%</td>
<td>53%</td>
<td>18%</td>
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- No difference in distant metastasis or second primaries
- Grade 3 toxicities or higher: 41% CXRT versus 21% XRT
Oropharyngeal Cancer
Chemotherapy

- Intergroup Phase 3 trial (Cooper 2004)
  - 416 patients among RTOG, ECOG, and SWOG from 1995-2000
    - 43% Oropharynx
    - 27% Oral cavity
    - 15% Supraglottis
    - 10% Hypopharynx
  - Compare adjuvant XRT versus adjuvant CXRT using cisplatin

- Two-year results
  - Locoregional control: 82% CXRT versus 72% XRT
  - Increased disease-free survival with CXRT
  - No difference in overall survival or distant metastasis
  - Adverse events
    - Grade 3 toxicities or higher: 77% CXRT versus 34% XRT
    - Four deaths in CXRT arm

- Chemotherapy potentiates effects of XRT
Treatment

Brachytherapy

- Single-center retrospective series from 1996-2004 (Cano 2009)
  - 88 patients with base of tongue SCCA
  - Primarily treated with CXRT and salvage neck dissection (ND)
  - Followed with interstitial brachytherapy to primary site

- T stage correlated with locoregional control and disease-specific and overall survival

- Three-year results
  - 87.5% Local control
  - 79.9% Locoregional control
  - 69.5% Disease-free survival
  - 80.9% Overall survival

- Complication rate 5-7% (mucositis, nausea, vomiting)
Treatment

Surgery

- **Oral**
  - Transoral resection
  - Mandibular lingual release

- **Transpharyngeal**
  - Suprahyoid pharyngotomy
  - Lateral pharyngotomy

- **Transmandibular**
  - Midline labiomandibular glosstomy
  - Mandibular swing
  - Mandibulectomy
Surgery
Transoral

- For small, superficial, or exophytic lesions
  - Soft palate, anterior tonsillar pillar, posterior pharyngeal wall
  - Requires 1-2cm margin

- Positives
  - Quick
  - Minimal morbidity
  - Satisfactory functional outcomes, may avoid XRT/CXRT
  - Transoral laser microsurgery (TLM)

- Negatives
  - Affected by trismus, mandibular height, and dentition
  - Limited visualization of posterior and deep margins
Surgery
Mandibular Lingual Release

- Deliver tongue and floor of mouth into neck
- Positives
  - Good for base of tongue lesions
  - Does not require lip split or mandibulotomy
- Negatives
  - Less access laterally to parapharyngeal space
  - Risk to lingual artery and nerve, hypoglossal nerve

(Bailey 2006)
Surgery

Suprahyoid Pharyngotomy

- Enter pharynx at vallecula
- Positives
  - Small tumors on base of tongue and pharyngeal walls
  - Preserves lingual artery and hypoglossal nerve
- Negatives
  - Inadequate superior margin with large tumors
  - Risk cutting into tumor if in vallecula or tongue base

(Bailey 2006)
Surgery

Lateral Pharyngotomy

- Enter pharynx posterior to thyroid ala
  - Retract hypoglossal and superior laryngeal nerves
  - Increase superior exposure across vallecula or lateral mandibulotomy

- Positives
  - Small base of tongue and pharyngeal wall tumors
  - View entire posterior pharyngeal wall, opposite lateral wall, and tongue base

- Negatives
  - Limited superior margin
  - Risk damaging hypoglossal and superior laryngeal nerves

(Bailey 2006)
Trotter Procedure

Split lip, gingiva, mandible, and tongue at midline

Positives
- Midline posterior pharynx or tongue base too low for transoral approach
- Spares hypoglossal nerve and lingual artery

Negatives
- No access to parapharyngeal or lateral oropharyngeal sites

*Surgery*

Midline Labiomandibular Glossotomy

(Bailey 2006)
Surgery

Midline Labiomandibular Glossotomy

- Trotter Procedure
  - Split lip, gingiva, mandible, and tongue at midline

Positives
- Midline posterior pharynx or tongue base too low for transoral approach
- Spares hypoglossal nerve and lingual artery

Negatives
- No access to parapharyngeal or lateral oropharyngeal sites

Get to da chopper!!!

Viet's Stupid Pnemonics
Surgery

Mandibular Swing

- Wide local excision
  - Incise lip and floor of mouth
  - Mandibulotomy anterior to mental nerve
  - Dissect carotid and lingual and hypoglossal nerves

- Positives
  - Wide exposure of entire oropharynx
  - En bloc resection with lymphadenectomy possible

- Negatives
  - Neck dissection to identify arteries and nerves
  - Usually requires free flap reconstruction
  - Contraindicated with mandibular involvement

(Bailey 2006)
**Surgery**

**Mandibulectomy**

- Composite resection
  - Incise lip and gingivobuccal sulcus
  - Usually preceding neck dissection

- **Positives**
  - Comparable approach with mandibular swing
  - Addresses mandibular invasion

- **Negatives**
  - Functional and cosmetic deficits
  - Mental canal transected
  - Usually requires free flap reconstruction

(Bailey 2006)
First described as salvage surgery by Huet in 1951

Conservative resection of selective tonsillar SCCA

Sometimes tracheostomy to secure airway

Contraindications

- Trismus or poor exposure
- Tonsillar fixation to lateral oropharyngeal wall
- Invasion
  - Mandible
  - Nasopharynx
  - Glossopharyngeal fold
  - Pharyngoepiglottic fold
  - Base of tongue
  - Vallecula
  - Pyriform sinus

(Holsinger 2005)
Transoral Surgical Approach
Lateral Oropharyngectomy

Incise raphe between superior constrictor and buccinator muscles.

Retract tonsil medially and develop submuscular plane.

Dissect in submuscular plane to prevertebral fascia.

Prominent vessel
Medial pterygoid

(Holsinger 2005)
- Buccopharyngeal fascia separates constrictors from retrostyloid parapharyngeal space
- Internal carotid is medial to fascia; internal maxillary lateral
- Ascending pharyngeal artery is also medial
Posterior pharyngeal flaps as needed to prevent rhinolalia

Reconstruct complete soft palatectomy with obturator
Transoral Laser Microsurgery
Single Modality

- Two-center retrospective series from 1996-2008 (Grant 2009)
  - No XRT indicated in 44 or refused in 25 patients
  - Mostly tonsil (41%) or tongue base (41%)

<table>
<thead>
<tr>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
</tr>
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<tbody>
<tr>
<td>36%</td>
<td>43%</td>
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<th>N2b</th>
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<tr>
<td>45%</td>
<td>16%</td>
<td>23%</td>
<td>9%</td>
<td>1%</td>
<td>3%</td>
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</tbody>
</table>

- Five-year results
  - 90-94% Local control
  - 74-82% Locoregional control
    - XRT not indicated: stage I (90%), II (73%), III (70%)
    - No difference between XRT not-indicated or refusal groups

<table>
<thead>
<tr>
<th>XRT Status</th>
<th>Not Indicated</th>
<th>Refused</th>
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<tr>
<td>Overall Survival</td>
<td>86%</td>
<td>49%</td>
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<tr>
<td>Disease-Free Survival</td>
<td>86-88%</td>
<td>72%</td>
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</table>

NOTES: Local recurrence addressed with additional TLM or XRT
Locoregional recurrence addressed with ND
Transoral Laser Microsurgery
Tonsillar SCCA

  - 102 patients, 83% with stage III or IV disease (N2 disease, 55%)
  - TLM with ND
  - Adjuvant XRT/CXRT if N > 2, nodal extracapsular spread, or primary with lymphovascular invasion

- Five-year results
  - 92% Local control
  - 97% Regional control
  - 94% Disease-free survival
  - 85% Overall survival
  - Local recurrence most common at contralateral tongue and tonsil

- T4 excluded
- Tracheotomy in 14, only 1 not decannulated
- Temporary feeding tubes in 35 all removed
- Four out of 16 partially dependent on gastrostomy tube
- Better results felt to be related to removing macro- and microscopic neck disease prior to XRT (and decrease XRT dose)
- Better function felt to be related to sparing of spinal accessory during ND
Transoral Laser Microsurgery
Tonsillar SCCA (continued)

- T4 disease excluded
- Permanent tracheostomy rate 1%
- Permanent feeding tube rate 4%
  - Temporary tube in 35 patients all removed
  - Four partially dependent on gastrostomy tubes placed in 16 patients
- Six with orocutaneous fistula, all healed
- Normal diet in 86%

**NOTES:**
- T4 excluded
- Tracheotomy in 14, only 1 not decannulated
- Temporary feeding tubes in 35 all removed
- Four out of 16 partially dependent on gastrostomy tube
- Better results felt to be related to removing macro- and microscopic neck disease prior to XRT (and decrease XRT dose)
- Better function felt to be related to sparing of spinal accessory during ND
Transoral Laser Microsurgery
Base of Tongue SCCA

- Single-center retrospective series from 1996-2005 (Henstrom 2009)
  - 20 patients, 95% with stage III or IV disease
  - TLM with ND
  - Adjuvant XRT/CXRT if N ≥ 2, nodal extracapsular spread, primary with lymphovascular invasion, stage IV tumors

- Two-year results
  - 95% Disease-free survival
  - 90% Overall survival

- Five-year overall survival 83%
  - Overall survival 83%
  - Local recurrence at contralateral base of tongue
80% with T1 or T2 tumors
No permanent tracheostomies
Two dependent on gastrostomy tubes placed in 9 patients
Three with orocutaneous fistula, all healed
Normal diet in 75%

(Arch Otolaryngol Head Neck Surg 2007; 133:1220-6)
- 50 patients with stage III or IV oropharyngeal SCCA
- Transoral robotic surgery with ND
- Adjuvant XRT/CXRT for large nodal disease or extracapsular spread, lymphovascular invasion, or positive margins

Two-year results
- HPV status: 37 positive, 13 negative
- No difference in local, locoregional, or distant recurrences

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<th>Classification</th>
<th>T3 or T4</th>
<th>Stage III or IV</th>
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<td>HPV Positive</td>
<td>24.3%</td>
<td>89.2%</td>
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<tr>
<td>HPV Negative</td>
<td>15.4%</td>
<td>76.9%</td>
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<tr>
<th>Overall Survival</th>
<th>1 Year</th>
<th>2 Year</th>
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<tbody>
<tr>
<td>HPV Positive</td>
<td>97.2%</td>
<td>81.0%</td>
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<tr>
<td>HPV Negative</td>
<td>90.9%</td>
<td>80.0%</td>
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<tr>
<th>Disease-Free Survival</th>
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<th>2 Year</th>
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<tr>
<td>HPV Positive</td>
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<tr>
<td>HPV Negative</td>
<td>100%</td>
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Oropharyngeal cancer often treated with a multimodality approach

Two distinct pathways
  - Carcinogen exposure from tobacco and alcohol
  - Genomic instability from HPV

HPV plays significant prognostic role

Transoral surgery affords favorable outcome in appropriately selected patients


