The International Federation of Head and Neck Oncologic Societies

Current Concepts in Head and Neck Surgery and Oncology 2017

www.ifhnos.net
TORS

Ehab Hanna
Disclosures

• Intuitive Surgical
  – OHSU TORS Course 2010
  – Proctor 2011
  – Unpaid consultant, 2014-6
  – National Fellow’s TORS Course 2015-6
  – Advanced TORS Course 2017

• MedRobotics
  – Unpaid consultant, 2014-6
Management of Head and Neck Cancer
Historical Perspective
TransOral Robotic Surgery (TORS)

• What is it?
• Why do it?
• Which patients?
• How is it done?
• What are the risks?
• What are the outcomes?
TransOral Robotic Surgery (TORS)

What is it?

• Another instrument
TransOral Robotic Surgery (TORS)
What is it?

- Another instrument
- Evolving technology
TransOral Robotic Surgery (TORS)

What is it?
TransOral Robotic Surgery (TORS)
Evolving Technology

Intuitive Surgical
TransOral Robotic Surgery (TORS)
Evolving Technology
TransOral Robotic Surgery (TORS)
What is it?

Another Instrument

• Advantages
  – HD +/- 3-D visualization
  – Increased instrument degree of freedom
  – Increased precision

“smaller than my fingers”
TransOral Robotic Surgery (TORS)

What it isn’t!

• Replacement of multidisciplinary management
TransOral Robotic Surgery (TORS)

• What is it?
• Why do it?
• Which patients?
• How is it done?
• What are the risks?
• What are the outcomes?
TransOral Robotic Surgery (TORS)
Why do it?
TransOral Robotic Surgery (TORS)

Why do it?

Sturgis E, Cinciripini P. *Cancer* 2007

Chaturvedi AK. *J Clin Oncol* 2011
TransOral Robotic Surgery (TORS)

Why do it?

• A Different Disease
HPV-Associated Head & Neck Cancer
A Different Disease
HPV-Associated Head & Neck Cancer
Improved Survival

Ang K et al. *NEJM* 2010
TransOral Robotic Surgery (TORS)
Why do it?

• Toxicity of radiation / chemoradiation
  – Xerostomia
  – Dysphagia
  – Esophageal stricture
  – Osteoradionecrosis
  – Hearing loss / neuropathy
TransOral Robotic Surgery (TORS)

Why do it?

- **Dysphagia**

  43% long-term grade 3/4 toxicity

<table>
<thead>
<tr>
<th>Variable</th>
<th>91-11</th>
<th>97-03</th>
<th>99-14</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeding tube dependence &gt; 2 years post-radiation therapy</td>
<td>—*</td>
<td>29*</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>RTOG late toxicity criteria, grade 3+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharyngeal dysfunction</td>
<td>16</td>
<td>28</td>
<td>19</td>
<td>63</td>
</tr>
<tr>
<td>Laryngeal dysfunction</td>
<td>22</td>
<td>6</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Death</td>
<td>11</td>
<td>9</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>Other (e.g., infection, fistula)</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Any</td>
<td>38†</td>
<td>40†</td>
<td>21†</td>
<td>99†</td>
</tr>
<tr>
<td>No severe late toxicity event (controls)</td>
<td>50</td>
<td>62</td>
<td>19</td>
<td>13</td>
</tr>
</tbody>
</table>

Machtay M *et al.* *J Clin Oncol* 2008
TransOral Robotic Surgery (TORS)

Why do it?

- Quality of Life
  - Dysphagia
    Increased 19% per 10Gy after 55Gy

Levendag P et al. *IJROBP* 2006
TransOral Robotic Surgery (TORS)

Why do it?

Right tongue weakness/atrophy 6 years post concurrent chemoradiation
TransOral Robotic Surgery (TORS)
Why do it?

ECOG 3311
Randomized Phase II “De-intensification” Trial
p16+
TransOral Robotic Surgery (TORS)
Why do it?

ECOG 3311

![Graph showing the response/toxicity rate vs radiation dose for normal tissue and tumor. The graph shows that as the radiation dose increases from 50 Gy to 70 Gy, the response/toxicity rate for normal tissue increases while the rate for tumor increases less. The graph also highlights the difference in the response/toxicity rates at these doses.]
TransOral Robotic Surgery (TORS)
Why NOT do it?
TransOral Robotic Surgery (TORS)

- What is it?
- Why do it?
- Which patients?
- How is it done?
- What are the risks?
- What are the outcomes?
TransOral Robotic Surgery (TORS)
Which Patients?

- **Patient factors**
  - Obstructive dentition
  - Trismus
  - Kyphosis

- **Tumor factors**
  - Large size
  - Extent beyond midline
  - Location

T1-2*
TransOral Robotic Surgery (TORS)  
Which Patients?

• Multidisciplinary approach
• Goal
  – Tailor individual treatment(s) based on pathologic staging
    • N1(2a?): Avoid radiation
    • N2b: Avoid chemotherapy
TransOral Robotic Surgery (TORS)

Patient Selection

- 55yo Male
- Smoker
- Prior oral cavity cancer
- New tonsil mass
- No adenopathy
- KPS 80

T1N0 SCC, p16-
TransOral Robotic Surgery (TORS)

Patient Selection

T1N0 SCC, p16-
TransOral Robotic Surgery (TORS)
Patient Selection

- 45yo Male
- Nonmoker
- 2.5cm tonsil mass
- Single lymph node
- KPS 100

T2N1 SCC, p16+
TransOral Robotic Surgery (TORS)
Patient Selection

T2N0 SCC, p16+
TransOral Robotic Surgery (TORS)
Patient Selection

T2N0 SCC, p16−
TransOral Robotic Surgery (TORS)
Patient Selection

T2N0 SCC, p16+
TransOral Robotic Surgery (TORS)

Patient Selection

T2N1 SCC, p16-
TransOral Robotic Surgery (TORS)
Patient Selection

T3N0 SCC, p16+
TransOral Robotic Surgery (TORS)
Patient Selection

T3N0 SCC, p16+
TransOral Robotic Surgery (TORS)

Patient Selection

- \textit{N1}
TransOral Robotic Surgery (TORS) Patient Selection

- N1
TransOral Robotic Surgery (TORS)
Patient Selection

- N2a
TransOral Robotic Surgery (TORS)
Patient Selection

- N2a
TransOral Robotic Surgery (TORS)
Patient Selection

• N2b
TransOral Robotic Surgery (TORS)
Patient Selection

• N2b?
TransOral Robotic Surgery (TORS)

Patient Selection

- N2c
TransOral Robotic Surgery (TORS)
Patient Selection

• N3
Questions
TransOral Robotic Surgery (TORS)

- What is it?
- Why do it?
- Which patients?
- **How is it done?**
- What are the risks?
- What are the outcomes?
TransOral Robotic Surgery (TORS)
Anatomy

Fig. 2. Vessels and nerves of the oropharynx.

Step 1: Patient Positioning

- Bed reversed
  - Turn head of bed 180 degrees
Step 1: Patient Positioning

- Nasal intubation
  - Shoulder roll
Step 2: Suspension Laryngoscopy

- Specialized Retractor
  - Tongue suture
  - Red rubber catheter +/-

Step 2: Suspension Laryngoscopy

- Tongue blades
Step 2: Suspension Laryngoscopy
Step 2: Suspension Laryngoscopy
Step 2: Suspension Laryngoscopy
Step 2: Suspension Laryngoscopy
Step 3: Dock Patient Cart
Step 3: Dock Patient Cart
Step 3: Dock Patient Cart

• Check general positioning
Step 4: Load Camera and Instruments
Step 4: Load Camera and Instruments

- Inverted “V” formation
- Instruments:
  - Bovie cautery
  - Maryland forceps
- Camera:
  - Tonsil = 0 degree
  - BOT = 30 degree
Step 4: Load Camera and Instruments

Tonsil  |  Base of Tongue  |  Larynx

Courtesy Scott Magnuson, MD
Step 4: Load Camera and Instruments
Step 4: Load Camera and Instruments
Step 4: Load Camera and Instruments
Bedside Assistant

• Dual Suction
  – Thoracic
• Clip appliers
Orientation / Inspection

Orientation / Inspection
Orientation / Inspection
Mucosal Cuts

- Superior to inferior
- Ptyergomandibular raphe
- 1cm margins
Mucosal Cuts
TransOral Robotic Surgery (TORS)

Technique
Dissect Submucosal Muscle Layer

- Palatoglossus
- Palatopharyngeus
- Superior constrictor muscle

Identify Parapharyngeal Space

- Parapharyngeal fat
- Medial pterygoid muscle
- Carotid pulsations
Identify Parapharyngeal Space
Apply Vascular Clips

- External carotid
  - Descending pharyngeal
  - Ascending pharyngeal
  - Ascending palatine
  - Tonsillar branch, facial artery
Apply Vascular Clips
Divide Deep Muscle Layer

- Glossopharyngeus
- Styloglossus
- Glossopharyngeal nerve
Divide Deep Muscle Layer
Management of margin status should be the same regardless of approach.
TransOral Robotic Surgery (TORS)
Margins

• Management of margin status should be the same regardless of approach
TransOral Robotic Surgery (TORS)

Margins

- Goal = 5mm margin
TransOral Robotic Surgery (TORS)

Margins

- Goal = 5mm margin
Questions
Perioperative Management

- Staging endoscopy sometimes helpful
- Tracheostomy rarely needed
- Neck dissection safe to perform during same surgery
  - Level 1 contents preserved
TransOral Robotic Surgery (TORS)

- What is it?
- Why do it?
- Which patients?
- How is it done?
- What are the risks?
- What are the outcomes?
TransOral Robotic Surgery (TORS)
Complications
TORS Complications
Bleeding
TORS Complications
Postoperative Bleeding Risk

- Incidence **1.5-13%**
  - Prior radiation increases risk
  - Anticoagulation increases risk

<table>
<thead>
<tr>
<th></th>
<th>Postoperative Hemorrhage</th>
<th>No Postoperative Hemorrhage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antithrombotic medication</td>
<td>8/48 = 17%</td>
<td>40/48 = 83%</td>
</tr>
<tr>
<td>No antithrombotic medication</td>
<td>3/99 = 3%</td>
<td>96/99 = 97%</td>
</tr>
</tbody>
</table>

*Relative risk = 5.5 (1.53, 19.81), P = .0057.

Asher S et al. *Otolaryngol Head Neck Surg* 2013
### TORS Outcomes Survey

**Postoperative Bleeding Risk**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of Incidences</th>
<th>% Total Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of complications</td>
<td>205</td>
<td>10.1</td>
</tr>
<tr>
<td>Patient death after transoral robotic surgery (TORS)</td>
<td>7</td>
<td>0.3</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>62</td>
<td>3.1</td>
</tr>
<tr>
<td>Dehydration requiring readmission</td>
<td>26</td>
<td>1.3</td>
</tr>
<tr>
<td>Aspiration pneumonia</td>
<td>22</td>
<td>1.1</td>
</tr>
<tr>
<td>Airway obstruction</td>
<td>4</td>
<td>0.2</td>
</tr>
<tr>
<td>Inadvertent lingual nerve injury</td>
<td>11</td>
<td>0.6</td>
</tr>
<tr>
<td>Temporary (&lt;2 mos) hypoglossal nerve injury</td>
<td>18</td>
<td>0.9</td>
</tr>
<tr>
<td>Prolonged (&gt;2 mos) hypoglossal nerve injury</td>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>Tooth injury</td>
<td>29</td>
<td>1.4</td>
</tr>
<tr>
<td>Orocutaneous fistula</td>
<td>3</td>
<td>0.2</td>
</tr>
<tr>
<td>Prolonged (&gt;6 mos) PEG tube dependency</td>
<td>21</td>
<td>1.0</td>
</tr>
<tr>
<td># patients with prolonged PEG tube dependency and prior history of XRT</td>
<td>14</td>
<td>0.7</td>
</tr>
</tbody>
</table>
TORS Complications
Postoperative Bleeding Severity

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Patient noting the presence of blood-tinged mucus, flecks of blood, brown mucus, or red streaks</td>
</tr>
<tr>
<td>Minor</td>
<td>Any description of bright red blood or blood clots Resolved without operative management whether or not physician evaluation or hospitalization occurred.</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Diffuse venous oozing or small arterial source bleeding resulting in operating room evaluation or intervention Managed with monopolar or bipolar cautery</td>
</tr>
<tr>
<td>Major</td>
<td>Brisk or copious bleeding requiring operative intervention Managed with transoral or transcervical vessel ligation, or interventional radiology embolization</td>
</tr>
<tr>
<td>Severe</td>
<td>Bleeding resulting in life-threatening medical complications such as: Hypoxia/airway compromise requiring tracheostomy Cardiopulmonary arrest Hemodynamic instability requiring blood transfusion</td>
</tr>
</tbody>
</table>

33/906 = 3.6%

Pollei TR et al. JAMA Otolaryngol 2013
## TORS Complications

### Deaths

<table>
<thead>
<tr>
<th>Event Type</th>
<th>No.</th>
<th>(%)</th>
<th>[95% Confidence Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall</td>
<td>3,194 (30.1)</td>
<td>[29.2–31.0]</td>
</tr>
<tr>
<td></td>
<td>Death</td>
<td>46 (1.4)</td>
<td>[1.0–1.8]</td>
</tr>
</tbody>
</table>

Alemzadeh H et al.  *PLOS One* 2016
TORS Complications
Bleeding Deaths

Table. Morbidity and Mortality Associated with a Surgical System in Otolaryngologic Procedures

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Events, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>14</td>
</tr>
<tr>
<td>Bleeding</td>
<td>11 (79)</td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (14)</td>
</tr>
<tr>
<td>Aspiration</td>
<td>1 (7)</td>
</tr>
</tbody>
</table>

Injury
<table>
<thead>
<tr>
<th>Etiology</th>
<th>Events, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns and trauma&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6 (55)</td>
</tr>
<tr>
<td>Bleeding</td>
<td>2 (18)</td>
</tr>
<tr>
<td>Other&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3 (27)</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
</tr>
</tbody>
</table>

Chen MM, Holsinger FC. *JAMA Otolaryngol* 2016
TORS Complications

Bleeding

Mishaps and deaths caused by surgical robots going underreported to FDA

BY KAISER HEALTH NEWS AND MARISSA EVANS November 1, 2013 at 11:31 AM EDT
TORS Complications
Timing of Bleeding

Richmon J. et al.  *Laryngoscope* 2014
Avoiding TORS Complications
ECA Ligation

Fig. 3. Vessels and nerves of the lateral oropharynx and base of tongue.

Avoiding TORS Complications
ECA Ligation

Perioperative Management

Bleeding

- 100% ECA Ligation

- 68% had prior history of radiation, anticoagulation and/or within first 50 cases
TORS Complications
Neurologic Injury

- Neuropraxia/
  Neurolysis
  - Glossopharyngeal nerve
  - Lingual nerve
  - Hypoglossal nerve

Holsinger FC et al. *Arch Otolaryngol Head Neck Surg* 2005
Perioperative Management

Pain

Week 1

LOS = 3-5 days
Perioperative Management

Pain

Week 2
Perioperative Management

Sequelae (expected events)
- Dysphagia
- Pain

Complications (adverse events)
- Pneumonia
- Dehydration
Perioperative Management
Another Instrument
Pain-Dysphagia

Prospective, Randomized, Placebo-Controlled, Double-Blinded Study
– N=81

TORs

- Intraoperative Dexamethasone + Placebo x 4 days
- Intraoperative Dexamethasone + Dexamethasone x 4 days

Clayburgh et al. Laryngoscope (in press)
1. Decreased hospital LOS
   • (median: 4 v. 5 days, $p < 0.001$)
2. Improved diet consistency
   • (PSS POD 7-21: 51.7 v. 36.7, $p = 0.009$)
Perioperative Management
Pain-Dysphagia

- 100% feeding tube
Perioperative Management
Dysphagia

• Early discharge?

Richmon J. et al. Laryngoscope 2014
TransOral Robotic Surgery (TORS)

• What is it?
• Why do it?
• Which patients?
• How is it done?
• What are the risks?
• What are the outcomes?
**TransOral Robotic Surgery (TORS)**

What are the outcomes?

- **Oncologic outcomes**

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients T Stage</th>
<th>Human Papillomavirus+</th>
<th>Overall Survival (%)</th>
<th>Disease-Specific Survival (%)</th>
<th>Recurrence-Free Survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 y</td>
<td>1.5 y</td>
<td>2 y</td>
</tr>
<tr>
<td>University of Alabama</td>
<td>89</td>
<td></td>
<td>96</td>
<td>81</td>
<td>98</td>
</tr>
<tr>
<td>University of Pennsylvania</td>
<td>50</td>
<td>74</td>
<td>96</td>
<td>81</td>
<td>98</td>
</tr>
<tr>
<td>Mount Sinai Medical Center</td>
<td>30</td>
<td></td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ohio State University</td>
<td>66</td>
<td>67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mayo Clinic</td>
<td>81</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>316</td>
<td>71</td>
<td></td>
<td></td>
<td></td>
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</table>

### Table 1. Patient and Tumor Characteristics (continued)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value (N = 410)&lt;sup&gt;a&lt;/sup&gt;</th>
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<tbody>
<tr>
<td>Multiple nodal positivity</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>110 (26.8)</td>
</tr>
<tr>
<td>No</td>
<td>241 (58.8)</td>
</tr>
<tr>
<td>Unknown</td>
<td>59 (14.4)</td>
</tr>
<tr>
<td>Extracapsular spread</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>58 (14.2)</td>
</tr>
<tr>
<td>No</td>
<td>100 (24.4)</td>
</tr>
<tr>
<td>Unknown</td>
<td>252 (61.5)</td>
</tr>
<tr>
<td>HPV status (229 patients tested)</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>70 (17.1)</td>
</tr>
<tr>
<td>Positive</td>
<td>159 (38.8)</td>
</tr>
<tr>
<td>Unknown</td>
<td>181 (44.1)</td>
</tr>
<tr>
<td>p16 positivity (219 patients tested)</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>61 (14.9)</td>
</tr>
<tr>
<td>Positive</td>
<td>158 (38.5)</td>
</tr>
<tr>
<td>Unknown</td>
<td>191 (46.6)</td>
</tr>
<tr>
<td>Neck dissection</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>323 (78.8)</td>
</tr>
<tr>
<td>No</td>
<td>77 (18.8)</td>
</tr>
<tr>
<td>Unknown</td>
<td>10 (2.4)</td>
</tr>
</tbody>
</table>

### Oncologic Outcomes After Transoral Robotic Surgery
A Multi-institutional Study

John R. de Almeida, MD, MSc; Ryan Li, MD; J. Scott Magnuson, MD; Richard V. Smith, MD; Eric Moore, MD; Georges Lawson, MD; Marc Remacle, MD; Ian Ganly, MD; Dennis H. Kraus, MD; Marita S. Teng, MD; Brett A. Miles, MD; Hillary White, MD; Umamaheswar Duvvuri, MD, PhD; Robert L. Ferris, MD, PhD; Vikas Mehta, MD; Krista Kiyosaki, MD; Edward J. Damrose, MD; Steven J. Wang, MD; Michael E. Kupferman, MD; Yoon Woo Koh, MD; Eric M. Genden, MD; F. Christopher Holsinger, MD

### Adjuvant treatment (338 patients)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Value (N = 338)&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiotherapy</td>
<td>106 (25.9)</td>
</tr>
<tr>
<td>Chemoradiotherapy</td>
<td>72 (17.5)</td>
</tr>
<tr>
<td>No adjuvant treatment received</td>
<td>160 (39.0)</td>
</tr>
<tr>
<td>Unknown</td>
<td>72 (17.6)</td>
</tr>
</tbody>
</table>
TransOral Robotic Surgery (TORS)
What are the outcomes?

Figure 1. Locoregional Control (LRC) for Patients Treated With Transoral Robotic Surgery (TORS)

A) LRC in patients with oropharyngeal cancer treated with TORS

B) LRC by pathologic margin status

<table>
<thead>
<tr>
<th>Site</th>
<th>No. at risk</th>
<th>Elapsed Time Since Surgery, mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-OP sites</td>
<td>40</td>
<td>21 5 0</td>
</tr>
<tr>
<td>Tongue base</td>
<td>128</td>
<td>59 11 1</td>
</tr>
<tr>
<td>OP wall and faucial arch</td>
<td>33</td>
<td>8 1 0</td>
</tr>
<tr>
<td>Soft palate</td>
<td>14</td>
<td>5 3 0</td>
</tr>
<tr>
<td>Tonsil</td>
<td>181</td>
<td>86 17 0</td>
</tr>
</tbody>
</table>

P = .01

<table>
<thead>
<tr>
<th>Margin Status</th>
<th>No. at risk</th>
<th>Elapsed Time Since Surgery, mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative margins</td>
<td>342</td>
<td>160 34 1</td>
</tr>
<tr>
<td>Positive margin</td>
<td>39</td>
<td>15 3 0</td>
</tr>
</tbody>
</table>

P = .001
TransOral Robotic Surgery (TORS)
What are the outcomes?

Table 3. Multivariate Analysis of Risk Factors for Locoregional Recurrence and All-Cause Mortality

<table>
<thead>
<tr>
<th>Factor</th>
<th>HR (95% CI)</th>
<th>P Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk Factors for Locoregional Recurrence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age &gt;60 y</td>
<td>2.49 (0.90-6.92)</td>
<td>.08</td>
</tr>
<tr>
<td>Smoking history</td>
<td>3.60 (0.81-15.9)</td>
<td>.09</td>
</tr>
<tr>
<td>Positive margins</td>
<td>2.43 (0.92-6.47)</td>
<td>.07</td>
</tr>
<tr>
<td>Tonsil primary site</td>
<td>0.28 (0.08-1.00)</td>
<td>.05</td>
</tr>
<tr>
<td>Oropharyngeal wall, faucial wall primary site</td>
<td>2.51 (0.87-7.28)</td>
<td>.09</td>
</tr>
<tr>
<td><strong>Risk Factors for All-Cause Mortality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age &gt;60 y</td>
<td>1.76 (0.79-3.96)</td>
<td>.17</td>
</tr>
<tr>
<td>Female sex</td>
<td>0.18 (0.02-0.92)</td>
<td>.05</td>
</tr>
<tr>
<td>Smoking history</td>
<td>6.90 (1.57-28.9)</td>
<td>.01</td>
</tr>
<tr>
<td>Tonsil primary site</td>
<td>0.18 (0.07-3.65)</td>
<td>.01</td>
</tr>
<tr>
<td>Oropharyngeal wall, faucial wall primary site</td>
<td>0.91 (0.36-3.23)</td>
<td>.90</td>
</tr>
<tr>
<td>Tongue base primary site</td>
<td>0.53 (0.26-1.68)</td>
<td>.39</td>
</tr>
</tbody>
</table>

Abbreviation: HR, hazard ratio.

a Cox proportional hazards model.

Figure 2. Overall Survival (OS) and Disease-Specific Survival (DSS) for Patients Treated With Transoral Robotic Surgery (TORS)

DSS and OS in patients with cancer treated with TORS (all sites, 396 patients)

Overall survival and DSS in all 396 study patients with head and neck cancer.

de Almeida et al. *JAMA Otolaryngol* 2015
TransOral Robotic Surgery (TORS)
What are the outcomes?

• Functional outcomes

Table 1
Transoral robotic surgery functional outcomes

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients</th>
<th>Tumor Site(s) T Stage</th>
<th>Temporary/Permanent Tracheostomy (%)</th>
<th>Oral Diet Only Within 6 wk (%)</th>
<th>Temporary/Permanent Gastrostomy Tube (%)</th>
<th>Preoperative/1 mo After MDADI</th>
<th>Baseline/3 mo/12 mo HNQOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Pennsylvania</td>
<td>47</td>
<td>OP T 1–4</td>
<td>11/0</td>
<td>0/2</td>
<td>0/2</td>
<td>76.3/61.2/76.8</td>
<td></td>
</tr>
<tr>
<td>University of Alabama</td>
<td>89</td>
<td>OC, OP, L T 1–4</td>
<td>3/0</td>
<td>79</td>
<td>25/0</td>
<td>77/61</td>
<td></td>
</tr>
<tr>
<td>Mount Sinai Medical Center</td>
<td>30</td>
<td>OP, L T 1–2</td>
<td>13/0</td>
<td></td>
<td></td>
<td>76.3/61.2/76.8</td>
<td></td>
</tr>
<tr>
<td>Mayo Clinic</td>
<td>66</td>
<td>OP T 1–3</td>
<td>26/2</td>
<td>97</td>
<td>27/5</td>
<td>78.7/67.9/77.9</td>
<td></td>
</tr>
<tr>
<td>Ohio State University</td>
<td>81</td>
<td>OP T 1–3</td>
<td>13/1</td>
<td>92</td>
<td>18/4</td>
<td>78.7/67.9/77.9</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>313</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TransOral Robotic Surgery (TORS)
Functional Outcomes Study

METHODS

- Single-institution retrospective study at MDACC
- Dual TORS and radiation databases merged
- IRB approved

<table>
<thead>
<tr>
<th>Surgical group</th>
<th>Non-surgical group</th>
</tr>
</thead>
<tbody>
<tr>
<td>● TORS +/- adjuvant</td>
<td>● Radiation +/- systemic</td>
</tr>
<tr>
<td>● 2010-15</td>
<td>● 2010-12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Previously untreated HPV+ OPSCC</td>
<td>● G-tube dependence at initiation of treatment</td>
</tr>
<tr>
<td>● T1-2</td>
<td>● Prophylactically placed G-tube</td>
</tr>
<tr>
<td>● N0-2b</td>
<td></td>
</tr>
<tr>
<td>● M0</td>
<td></td>
</tr>
<tr>
<td>● Tonsil or base of tongue</td>
<td></td>
</tr>
</tbody>
</table>
Outcome Measures

1. Weight loss
   \[ \Delta \text{Weight (baseline to >90 days post treatment)} \]

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5% to &lt;10% from baseline</td>
</tr>
<tr>
<td>2</td>
<td>10% to &lt;20% from baseline; nutritional support indicated</td>
</tr>
<tr>
<td>3</td>
<td>[\geq20% \text{ from baseline;} \text{ tube feeding or TPN indicated}]</td>
</tr>
</tbody>
</table>
• Outcome Measures

1. Weight loss
   - Δ Weight (baseline to >90 days post treatment)
   - CTCAE v.4.03

2. Gastrostomy tube placement
   - Incidence (baseline to 90 days post treatment)
TransOral Robotic Surgery (TORS) Functional Outcomes Study

RESULTS

G-tube incidence

Incidence of gastrostomy tube placement (baseline to 90 days post treatment)

The incidence of gastrostomy tube placement anytime was significantly lower among Surgical patients compared to Non-surgical patients \( p < 0.001 \)

\[\frac{4}{6}  \div 70/1\]

Functional Outcomes Study

TransOral Robotic Surgery (TORS)
### TransOral Robotic Surgery (TORS)
#### Functional Outcomes Study

**RESULTS**

Multivariable model showing Odds Ratio of Gastrostomy Tube placement

<table>
<thead>
<tr>
<th>Multivariable Model Covariate</th>
<th>OR (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-stage</td>
<td>3.27 (1.67-6.41)</td>
<td>0.001</td>
</tr>
<tr>
<td>Primary subsite (Tongue base vs. Tonsil)</td>
<td>2.08 (1.06-4.07)</td>
<td>0.032</td>
</tr>
<tr>
<td>Non-Surgical vs. Surgical</td>
<td>10.6 (3.61-31.13)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

OR = Odds Ratio  
CI = Confidence Interval

Patients treated non-surgically were 10.6x more likely to have a G-tube placed.
TransOral Robotic Surgery (TORS)
Functional Outcomes Study

RESULTS

Severity of weight loss during treatment was significantly lower among the Surgical group compared to the Non-surgical group.

CTCAE Dysphagia Toxicity Grades

CTCAE = Common Terminology Criteria for Adverse Events; TPN = Total parenteral nutrition.
TransOral Robotic Surgery (TORS)
What are the outcomes?

• MDACC “Fitbit” study
HPV is changing the face of head and neck cancer
   – New approaches warranted

TORS is a technique to reduce long-term toxicity via more tailored application of therapies
TransOral Robotic Surgery (TORS)

Summary

• Technique matters
  – Steep learning curve
  – Attention to perioperative management can minimize risks

• Oncologic and functional outcomes are promising
  – Rigorous outcomes data and clinical trials are still needed
Questions
ngross@mdanderson.org
@DrNeilGross