Communication Rehabilitation with People Treated for Oral Cancer

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Cancer ↔ malignant growth

- Characteristics
  - Cell growth that is
    - Ongoing
    - Purposeless
    - Unwanted
    - Uncontrolled
    - Damaging
  - Cells that
    - Differ structurally
    - Differ functionally

Formation of Cancer

- **NORMAL**: Genes in DNA = controlled division, growth, and cell death
- **CANCER**
  - Genetic control lost or abnormal
  - Abnormal cell divides again and again
  - Mass of unwanted, dividing cells continues to grow
  - Potential damage other cells/tissues in body
  - Controls that stop continued division lost/impaired

Several types of cancer

- Squamous cell = we see most often in oral cavity

Anatomy

Regions for designating cancer location

- Following six slides have images from
  - International Agency for Research on Cancer (IARC)
  - IARC link to Trivandrum Screening

Trivandrum Oral Cancer Screening Project.

“A digital manual for the early diagnosis of oral neoplasia.”

Lip (vermilion) = reddish hued area.

Labial mucosa = thin(ner) lining of the inside of the lips.
Lip & Oral Cavity Anatomy Review

**Regions for designating cancer location**

**Buccal mucosa** = lining of cheeks.

**Gingiva** = tissue covering the neck of the teeth and alveolar ridge.

**Alveolar ridge** = bony ridge that holds the teeth.

**Retromolar trigone** = small triangular area behind the last lower molar on each side.

**Anterior 2/3 of tongue** = mobile portion of tongue.

**Filiform papillae** = many, fine, pointed, cone shaped, (blue arrow)

**Fungiform papillae** = mushroom-shaped, reddish, dorsum of tongue, (yellow arrow)

**Circumvallate papillae** = nodular appearing, posterior 1/3 of tongue, (BB-10)

**Foliate papillae** = leaf shaped, where side of tongue meets palatoglossal fold, minor salivary glands, lymphoid follicles

**Floor of mouth** = horseshoe-shaped, between ventrum of tongue and gingivae of mandibular teeth, extends to palatoglossal folds posteriorly

**Hard palate** = roof of oral cavity, contiguous with alveolar ridge of the maxilla and with the soft palate

**Practice Time**
Head & Neck Cancer by the Numbers

**Incidence?** Cases in a population
- **Incidence rate**: new cases within specified period of time
- **Incidence proportion**: proportion of initially disease-free population that develops the disease

**Prevalence?** Actual number of people alive with the disease
- **Period Prevalence**: during a particular period of time
- **Point Prevalence**: at a particular date in time

**Mortality?** # deaths in certain time period within a certain population

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Oral Cancer Incidence Rate Data

- Worldwide: 405,000 new cases per year
  - **Highest rates**: Sri Lanka, India, Pakistan, Bangladesh, Hungary, France
- United States: 53,000

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IARC Lip, Oral Cavity Worldwide Incidence Rates

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Oral Cancer stats for the USA

- **SEER is a good place to look** for all kinds of data for the USA
  - (Surveillance, Epidemiology and End-Results Program)

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Oral Cancer – USA incidence

<table>
<thead>
<tr>
<th>Oral cavity and pharynx</th>
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<tr>
<td>Pharynx</td>
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<tr>
<td>Tongue</td>
<td>2,206</td>
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<tr>
<td>Buccal</td>
<td>1,580</td>
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<tr>
<td>Uvula</td>
<td>4,090</td>
</tr>
<tr>
<td>Larynx</td>
<td>52,097</td>
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<tr>
<td>Other oral cavity</td>
<td>1,774</td>
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Oral Cancer – MI incidence

<table>
<thead>
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<td>Larynx</td>
<td>1,320</td>
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<tr>
<td>Buccal</td>
<td>720</td>
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<tr>
<td>Other oral cavity</td>
<td>1,960</td>
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3/18/2019
Increasing Incidence of HNSCC

Increased incidence of *some types* of oral, head and neck squamous cell carcinoma over the last 3 decades.

Despite decreasing smoking rates

Base of tongue, tonsil in particular – and particularly for white men

Head Neck Oncol. 2009 Oct 14;1:36. www.headandneckoncology.org/content/1/1/36

Primary reason for this increase - HPV

- Very common virus
- 50% sexually active adults with HPV infection in their lifetime
- >130 strains or genotypes
- Most of these strains are harmless, treatable, and or noncancerous

HPV – Oral Cancer

- Fastest growing oral and oropharyngeal cancer population
  - Otherwise healthy
  - Non-smoking
  - 35-55 years old
  - More males than females (4:1)
  - HPV usually manifests in oropharynx, but also for more anterior oral sites

Sexual Transmission of HPV

- behavioral epidemiologists → changing sexual behaviors in the 1960s led to increased HPV exposure.
- Several studies = oral HPV infection is likely to be sexually acquired.
  - E.g., D’Souza and colleagues found that a high (26 or more) number of lifetime vaginal-sex partners and 6 or more lifetime oral-sex partners were associated with an increased risk of HNSCC

- Men 2x > Women
- Death rates declining 1%-2% past decade
- Survival deteriorates moving from lips to larynx
- 10%-15% have other head & neck tumors

AND OTHERS
- DevCan – National Cancer Institute
- Head and Neck Cancer Alliance: http://www.headandneck.org/
- Support for People with Oral and Head and Neck Cancer: http://www.spohnc.org/

Currently in the US – some general conclusions for Oral Cavity and Pharynx cancers

- Men 2x > Women
- Death rates declining 1%-2% past decade
- Survival deteriorates moving from lips to larynx
- 10%-15% have other head & neck tumors
Etiologic agents and risk factors

Tobacco Products:
- Smoking Tobacco
- Cigarettes
- Cigars
- Pipes
- Chewing Tobacco
- Snuff

Chemicals:
- Asbestos
- Chromium
- Nickel
- Arsenic
- Formaldehyde

Other Factors:
- Ionizing Radiation
- Epstein-Barr Virus
- Human Papilloma Virus

Ethanol Products

Laryngopharyngeal Reflux

And more
- Genetic factors
- Diet low in fruits and veggies
- Sun exposure (lips)
- Wind exposure (lips)
- Areca nut, betel nut, betel leaf; paan, pan masal, supari

Reminder of synergistic impact of smoking and drinking
- Doing both is worse than doing either one individually
- Most who smoke also drink alcohol (reverse not true)
- OR of heavy drinking + heavy smoking significantly increased vs either behavior alone

Staging & Surgical-Oncological Tx
- Clinical guidelines available – based heavily on
  - Size, local spread, distant spread (i.e., staging)
  - Patient wishes
  - Comorbidities
- Briefly… staging

Staging
- Clinical vs. pathologic (surgical)
- American Joint Committee on Cancer (AJCC)
- Stage 0, I, II, III, IVA, IVB, IVC
- AJCC for Lip, Oral Cavity, p16 neg OP Cancer
  - T – primary tumor size
  - N – lymph node spread
  - M – distant spread
Surgery, Radiation & Chemotherapy for Oral Cancer

**OVERALL Approach**

- Surgical resection as 1st
  - Particularly with early stages (T1/T2, N0)
  - +/- reconstruction
  - +/- elective neck dissection; sentinel node biopsy
- Radiotherapy or Chemoradiation as Adjuvant

[Note: Oropharyngeal = more nonsurgical, and minimally invasive surgery]

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Resection - more pics later

- **Removal of tissue**
  - Tumor size & location dictates removal volume
    - E.g., Tongue
      - Partial (<40%)
      - Hemi (40%-60%)
      - Subtotal (>60% - almost all)
      - Total (100%)

Reconstruction Ladder - more later

- Healing by secondary intention
- Primary closure
- Skin grafting (split or full thickness)
- Composite grafts
- Locoregional flaps
- Free tissue transfer
Primary and Secondary Intention

Free Flaps – also various →

Neck Dissection – also various extents

Neck Dissection
- >50% pts with OSCC = lymph metastases
- Most important prognostic factor = lymph mets
- 50% reduction in 5yr survival of regional nodes involved
- SO → treating the neck is critical
- Therapeutic – Opportune – Elective

Neck Dissection
- Treating the person with “N0” neck
- Elective Neck Dissection
  - 3 RCT = advantages for survival
  - Most offer it – still some controversy
- Sentinel Lymph Node Biopsy

Flaps - local, regional → examples

Pedicle flap (converts to free flap)
Submental Island Flap
Pectoralis Major Myocutaneous Flap
Radiation Therapy

3 ways to deliver
- External beam radiation therapy – common for oral
- Brachytherapy (internal radiation therapy)
- Systemic radiation

Mode of impact = damages cell DNA; damaged cells stop dividing or die

Briefly – external beam

- ‘Simulation’
  - planning
  - Detailed imaging (CT, could be MRI, PET, ultrasound)
- Mask - stabilize head
  - Computer + MD - determine dose, area of exposure, safest paths of radiation delivery, schedule of treatment intensity/duration

External beam - delivery

- Various schedules and approaches now
  - Historically - 5 days/week for 6-7 weeks

- Other fractionation schedules in use
  - Hyperfractionation – smaller dose more than 1x day
  - Hypofractionation – larger dose 1 day or less
  - Accelerated fractionation – larger daily or weekly doses

Last on external beam

- IMRT = intensity-modulated radiation therapy
  - “beam shaping”
  - Varied radiation intensity to different areas/depths
  - Reverse planning
  - 3D-CRT = 3-dimensional conformal radiation therapy
  - IGRT…Tomotherapy…Stereotactic radiosurgery

Chemotherapy – briefly

- Drugs - slow or stop growth of cancer cells

- Combo with radiation Tx in head and neck cancer in many instances
  - To make a tumor smaller
  - Destroy cancer cells remaining after XRT or surgery
  - Enhance other treatments
  - Kill cancer cells that recur

Side Effects – some impacting speech

- Mucositis
- Xerostomia
- Candida, other
- Lymphedema
- Fibrosis
Side Effects — some impacting speech

- Dysgeusia
- Dermatitis
- Dental decay
- Osteoradionecrosis

Chemotherapy

Cisplatin — standard treatment for H&N SCC

- Intravenous
  - Common side effects
    - Nausea, vomiting
    - Low blood count
    - Renal toxicity
  - Ototoxicity
    - Altered blood test results (magn., calcium, potassium)
- Less common side effects: Peripheral neuropathy, Decreased appetite, Taste sensation change, Hair loss

Oral Cancer Impact on Speech

- Cancer impact
- Cancer treatment impact — surgery, radiation

Oral Cancer Impact on Speech Before any treatment

- N=172 (125M/47F)
- Dx:
  - Maxillary alveolar ridge — 9
  - Buccal mucosa — 12
  - Margin tongue — 42
  - Palate — 8
  - Oral floor — 50
  - Mandibular alveolar ridge — 51
- 12% lower Word Recognition
- Female > Male (OSCC)
- Age and gender → WR
- Location of tumor mattered

Oral Cancer Impact on Speech Before any treatment — self-report

- N=21
- Oral cancers + 1 BOT
- Interviews + thematic analysis
- Detection of Speech Changes?

Change in eating or talking. Many patients noted that they had experienced some interference with functions during the development of the disease. Frequently, patients made a point that the pain or discomfort that they experienced as a result of their oral lesion was only experienced during muscleation or when they spoke.

I can’t chew. As soon as this started I don’t chew. I just swallow. It doesn’t get worse unless I chew. I’ve got some grandchildren at home and I shush at them—the kids scream. So I’ve been trying not to chew or shout. (17; no prolonged delay)
Oral Cancer Treatment - Impact on Speech

This is primarily what we deal with.

Reconstruction
• Type
• Size
• Mobility

Radiation-Chemo
• Acute impacts
• Latent impacts

Communication

Articulation
Hearing
Reconstruction
• Type
• Size
• Mobility

Sub-set of tumor locations considered here
- Tongue
- Palate (hard/soft)
- Lips

A few details on each of these with links to speech.

Degrees of Tongue Resection
- Partial Glossectomy
- Hemiglossectomy
- Sub-total of Near-total glossectomy
- Total glossectomy
Partial Glossectomy

Primary closure

Hemiglossectomy and Near-total Glossectomy

- Free tissue reconstruction usually preferred
  - Can match flap to defect in terms of size/volume
  - Large defects can be filled
  - Possibility for microneurovascular procedure
  - Flap tissue not exposed to XRT

Radial forearm free flap

Total glossectomy

- Tongue "pull through" technique unless tumor invades mandible
- May require rectus abdominis or anterior lateral thigh flap rather than forearm due to need for increased bulk

Pectoralis flap
Anterolateral thigh flap

Total glossectomy

Tongue Cancer Surgery – what changes?

- Mass
- Mobility
- Oral cavity space
  - Volume
  - Contour
- Sensation
- Besides speech
  - Saliva issues
  - Eating/chewing
  - Appearance

Example: Partial Glossectomy +

Case 1. DH

Age at video = 65
Smoker who quit at 57
Dx with FOM, lingual cancer at 59
TX sequence
1. 48 radiation treatments soon after Dx
2. 5yrs later (age 64) cancer returned aggressively
3. FOM+lingual resection; radial forearm flap
4. Some SLP follow-up for swallow, not speech
Partial Glossectomy

Case 2.

Female
early 20's
Non-smoker

Partial Glossectomy: Case 2

Before my cancer diagnosis

This is what tongue cancer looked like on my tongue. I had a small sore that grew to this size in 1.5 months. The sooner you see a doctor, the more they can help you and save your tongue, and prevent metastasis. Please don't wait as long as I did. Tongue cancer is one of the first cancers on the rise, especially in young people.

link to immediate post surgery

Partial Glossectomy: Case 2

Just after surgery #1

You can see the black stitches. The tongue remained very swollen for about 3 days. Swelling continued for another 1.5 weeks until it went back to normal. My new "normal" is now a thinner tongue with a slight missing from the side where they cut out the cancer plus a scar tissue around it. I have difficulty moving food around and have periods of extreme pain. I can barely speak. With dry mouth, the "good bacteria" does not work, so they must be given supplemental to growing "bad bacteria." This is very normal. Posts with stimulated the subject to wash out and keep posts.

Partial Glossectomy: Case 2

After 7 sessions and 3 weeks before my 7 weeks of chemo and radiation began

I got a hard time with required medicine to eliminate those painful bumps in my throat and the back of my tongue. I could barely swallow. With dry mouth, the "good bacteria" does not work, so they must be given supplemental to growing "bad bacteria." This is very normal. Posts with stimulated the subject to wash out and keep posts.

Partial Glossectomy: Case 2

After about 3 weeks of radiation

Catherine’s story through radiation

I had mucositis (worst side effect for me). With this condition, even lukewarm water caused extreme pain to my tongue. It was also difficult to talk because the tip of my tongue would touch my teeth while pronouncing some words. So I wrote a lot. I wouldn’t with mucositis on my worst enemy.

Partial Glossectomy: Case 2

After about 4 weeks of radiation

Even though I do it mouthwash a day, and take a ton of meds, even water, nothing takes away the pain of eating/drinking. Absolutely horrible! It was even painful to take this picture. (Note: After tongue surgery, I can no longer stick my tongue out very far. No more ice cream cones.) Also made speech with the letter "S."
Partial Glossectomy: Case 2

Now, after treatment, I have received gams (increased sensitivity). Yes, the side effects they tell you about are very real! I also have dry mouth from 31 days of radiation. One saliva gland was completely removed and the remaining glands get irradiated very hard and don’t function well now. I carry water everywhere I go. Check out bloomkansens.com for a good one bottle!

Near-Total glossectomy: Case example

ODE TO THE PRESENT.

This moment as smooth as a board
This hour, this day as clean as an untouched glass
Not a single spiderweb from the past
We touch the moment with our fingers
We cut it to size, we direct its blooming
It’s living, it’s alive, it brings nothing
from yesterday that can’t be redeemed
nothing from the lost past. This is our creation
It’s growing this very instant, kicking up sand
or eating out of our hand.

Palatal tumors

Palatal Malignancies – a bit more variety

- Squamous Cell
- Adenoid Cystic
- Adenocarcinoma
- Mucoepidermoid Ca
- Other
- Anaplastic Ca

Palatal Cancers

- Not very common
- Soft palate > hard palate
- Soft palate causes – as before
- Hard palate –
  - perhaps as before; reverse smoking; syphilis; irritation from dentures?
  - Often late presentation (months to years)
Hard Palate Resection

- Approach based on size
  - Small lesion = transoral, partial maxillectomy
  - Larger = partial maxillectomy → lateral rhinotomy
  - Large extending through palate → total maxillectomy
- Palate is midline structure
  - Neck treated bilaterally—END
- Combo Surgery + XRT for most

Hard Palate - Obturation

Hard Palate – Obturation = historical gold standard

- Radial forearm (Jeong et al., 2017)
- Rectus abdominus flap (Ogino, et al., 2019)
- Anterolateral thigh; latissimus dorsi, fibula osteocutaneous, etc. (Hanasono et al., 2012)

Soft Palate Resection - obturation

Lip Cancer
Lip Cancer - Treatment

- Really depends on staging, regional node involvement, distant metastasis
- Often caught early so local excision with no, or minor, reconstruction

Lip Cancer – surgical examples

Excision with primary closure

Lip Cancer - surgery

- Lip flap
  - Remove tumor from top lip
  - Raise flap from lower lip
  - Close upper lip defect

Excision with lip reconstruction

Lip Cancer: Case Study (all lower lip)

- 40 yr old
- Smoker for 20+ years
- Lip cancer dx at age 38
- Sequence of Tx
  - Radiation (38) and chemo (16)
  - Cancer returned quickly (2 weeks)
  - Resection (lower lip, FOM, jaw) w/ reconstruction (multiple)

Projected Problems

- Articulation
- Resonance
- Intelligibility
- Articulatory Precision / clarity
- Acceptability
- Naturalness
- Speaker
- Listener
- Tongue
- Hard Palate
- Soft Palate
- Lips
The literature? → speech intelligibility

- **N=27**
- 3 groups
- Ratings of SI, other measures
- At 6 months post surgery
- "intelligible" after partial (12)
- "partially intelligible" after subtotal (9)
- "intelligible with attention" after total

Sampling of others regarding SI

<table>
<thead>
<tr>
<th>Details</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem et al. (2006)</td>
<td>39; total &amp; near total; 1 yr post - 8% = unintelligible - 92% = intelligible - SI task/rating unclear</td>
</tr>
<tr>
<td>Carvalho et al. (2008)</td>
<td>36; hemi &amp; near total; wearing palatal augmentation - 22% = normal SI - 33% = mild impairment - 29% = moderate - 22% = severe - Better with vs w/o pros</td>
</tr>
<tr>
<td>Bonggreven et al. (2007)</td>
<td>80; oral and oropharyngeal; 1 yr post; flap recon - 71% = deviant SI (rating)</td>
</tr>
<tr>
<td>Romer et al. (2019)</td>
<td>81; T1/T2 oral SCC, no reconstr - &quot;excellent&quot; speech outcomes</td>
</tr>
<tr>
<td>Steltze et al. (2013)</td>
<td>72; tongue, FOM, mandible alveolar ridge - WR at 12 months 28% lower for all vs control</td>
</tr>
<tr>
<td>Lee et al. (2014)</td>
<td>63; oral tongue, most T1; partials - Mean &quot;understandability rating&quot; = 88%</td>
</tr>
</tbody>
</table>

Dwivedi et al – other findings

- Overall Speech Quality (self-report)
  - OC: 35% good-excellent 65% ave – poor
  - OPC: 76% good-excel 24% ave/ - poor
  - OC and OPC – speech worse in evening → fatigue
  - More severe speech-related psycho-social impairment -OC
    1. Feelings of incompetence bc of speech
    2. Avoidance of groups bc of speech
    3. Feeling tense while talking because of distorted speech
    4. Avoidance of going out bc of speech

Predictors of Speech outcomes (on UW-QOL) at 12 mos:
- Tumor size (smaller = better)
- XRT (none = better)
- Closure/reconstruction (primary = better)
- Neck dissection (less extensive = better)
Zyudam et al - Results

- Importance of speech function to survivors at 1yr – relative to other choices
  - Saliva (14)
  - Chewing (13)
  - Speech (13)
  - Swallowing (10)
  - Activity (8)
  - Appearance (7)
  - Anxiety (6)
  - Taste (6)
  - Mood (5)
  - Pain (5)
  - Shoulder (4)
  - Recreation (2)

What to make of it all? – some nuggets

- Greater resection volume = worse speech (Bohle et al., 2005; Furia et al., 2001; Ji et al., 2017)
- Increased tongue mobility & strength = higher SI [partial & hemi] (Kreeft et al., 2009; Lazarus et al., 2013)
- Highly variable SI after total and subtotal (Kreeft et al., 2009)
- Correlation bulk and contours of reconstructed tongue (Kimata et al., 2003; Seikaly et al., 2003)
- Maxillectomy reduces speech function & SI  but generally well managed prosthetically (Putran et al., 2002)

More Nuggets

- Patient reported speech outcomes = lower than clinical measures (Rinkel et al., 2015)
- Radiation Therapy Impact?
  - RT as primary: variable outcomes
  - RT as adjuvant: tends to worsen speech outcomes (Kreeft et al., 2009)

<table>
<thead>
<tr>
<th>Radiation Therapy Impact</th>
<th>No Significant Impact</th>
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<tbody>
<tr>
<td>Nicoletti et al. (2004)</td>
<td></td>
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</table>

- Soft palate involvement = worse speech outcomes (Bohle et al., 2005)

Lymphedema – speech?

- Acute and latent impacts on speech reported (Deng et al., 2013; Jackson et al., 2016; Payakachat et al., 2013)
- “my tongue swelling, it impacted my speech… it impacted my ability to eat” (Deng et al., 2016, p.1271)
- “At times I feel my tongue is too big for my mouth and my speech is then very slurred and much worse than what it is now… very difficult to understand” (Jeans et al., 2018, p.5)
- “I'm not talking normal because of the swelling of the tongue” (Jeans et al., 2018, p.5)

SLP Roles: Pre-operative/Pre-XRT

- Baseline:
  - Speech production – characteristics, deficits
  - Intelligibility
  - Communication needs
  - Speech-Com QOL
  - Cognitive-Comm

- Phoneme inventory
- Oral mech exam
**SLP Roles: Pre-operative/Pre-XRT**

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<td>Interview, self-report</td>
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<tr>
<td>Speech impact</td>
<td>Speech Handicap Index (Volkert et al., 2004; Dwivedi et al., 2011)</td>
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<tr>
<td></td>
<td>Communication Participation Inventory Bank (CPIB) (Volkert et al., 2011)</td>
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<tr>
<td>Speech Production</td>
<td>Phoneme Inventory or Artic Test</td>
</tr>
<tr>
<td></td>
<td>Speech Intelligibility, Acceptability</td>
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<tr>
<td>Oral mech exam</td>
<td>Rate, range, speed, coordination; symmetry</td>
</tr>
<tr>
<td>Hearing</td>
<td>Make sure it is not forgotten</td>
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**CPIB**

The Communications Participation Inventory Bank (CPIB) is a tool used to assess the communication needs of individuals who have experienced a hearing loss. It evaluates various aspects of communication, including the ability to understand and be understood in different situations. The CPIB consists of several sub-scales, each focusing on a specific aspect of communication.

**Hearing Status**

- Age-related decline is possible
- Treatment related alteration (chemo) also possible
- Cisplatin + radiation = SNHL (e.g., Hitchcock et al., 2009; Zuur et al., 2007)
- Baseline hearing prior to starting radiation-chemo-surgery; period reassessment after

**Cognitive Function (CF)**

- Baseline is important
- Post
- Periodic assessment thereafter
- Bond et al (2012, 2016): CF decrease even before Tx; 13% with language deficits post chemorad
- Gan et al (2011): CF decline in 90% of HNC pts at 16 months post
- Degree of CF correlated with radiation dose
- Various memory abilities most impacted
- Hsiao et al (2010) - similar

**Post Surgery**

- What was done?
- What structures are left?
- How do they move?
- Further plans? - more surgery; chemoradiation; prosthetics?
SLP Roles Post: Repeat
Lingual and Labial Cancer Patients

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SLP Roles Post: Specific to Lingual

- 2 primary roles
  - Communication rehabilitation
  - Participation in prosthetic attempts
    - Palatal augmentation
    - Lingual prosthetic

SLP Roles Post: Specific to Lingual
Lingual Prosthetics

- 5 studies specific to Oral Cancer only – palatal augmentation
  - 3/5 = improved speech intelligibility
  - More improvement in those with larger resections
  - 1 other showing vowel formants closer to pre-op

SLP Roles Post: Specific to Lingual
Palatal Augmentation Prosthesis

- 14 studies specific to Oral and Base of Tongue – palatal augmentation and lingual prostheses
  - Intelligibility improve for vowels (2 studies), consonants (5), sentences (1), conversation (6)
  - Improved resonance (4)
  - Improved voice quality (3)
SLP Roles Post: Lingual & Palatal Augmentation Prosthesis

- Be on the team
  - Maxillofacial Prosthodontist
  - You
  - Head & Neck Surgeon
  - Dietetics
  - Etc.
- Speech (and swallow) evals
  - Baseline
  - During construction as appropriate
  - Post final construction
- Primary speech foci = SI

SLP Interventions

- What’s been tried?
- Does it work?

SLP Interventions for Glossectomy

What’s been tried?

- Understand …
  - Remaining structures
  - Movement capabilities
  - Relation to other structures
- Train alternative productions of problematic speech sounds

SLP Roles Post: Specific to Labial

- Pre-post testing of maxillary and velopharyngeal prosthetics
- How to
  - Perceptual
  - Nasometry
  - Flexible endoscopy
  - Aerodynamics

Tongue Resections – historically attempted substitutions for consonants

<table>
<thead>
<tr>
<th>Phoneme</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>/t/d/n</td>
<td>sub lower lip for tongue tip</td>
</tr>
<tr>
<td>/s/z/</td>
<td>slit btw upper/lower teeth or slit btw tensed/spread lower lips</td>
</tr>
<tr>
<td>/k/g/ng</td>
<td>pharyngeal contact with?</td>
</tr>
<tr>
<td>/l/</td>
<td>midpoint lip-lip; buccal?</td>
</tr>
<tr>
<td>/r/</td>
<td>vocalic /r/; overlap lips</td>
</tr>
<tr>
<td>/th/</td>
<td>draw lower lip down from inside of upper lip and teeth</td>
</tr>
<tr>
<td>/sh, ch</td>
<td>nothing great (try for any fricative)</td>
</tr>
</tbody>
</table>

and Vowels?

- usually less focus
  (more so with total and near-total glossectomy)

<table>
<thead>
<tr>
<th>Vowels</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>front/back (e/a)</td>
<td>mandibular thrust</td>
</tr>
<tr>
<td>hi/lo (i/a)</td>
<td>mand. Elevation</td>
</tr>
<tr>
<td>short/long (i/ii)</td>
<td>duration</td>
</tr>
</tbody>
</table>

NOTE:
Old training lit mostly regarding people with laryngectomy + glossectomy.
SLP Roles Post: Specific to Palatal

- Expectations – usually not much
- General intelligibility strategies

Does SLP Intervention Help?

- N=27 in 3 groups
  - Total glossectomy (GRP1)
  - Subtotal glossectomy (GRP2 – retained BOT)
  - Hemiglossectomy (GRP3)

10-12 Tx session (3-6 months)
Rating 0-7 “understandable … vowels, CV, VCV
“Intelligibility” rated (4 pt scale) – spontaneous speech
1. Intelligible indicates clear, with no difficulty what ever understanding the speech.
2. Partial intelligible, some difficulty understanding part of the sentence, but core words understood
3. Intelligible with attention, much difficulty understanding part of the sentence, with loss in comprehension of the core words
4. Unintelligible, Very difficult to understand the sentence and all of the story

What was the therapy?

- Maximize residual tongue movement
- Adaptive articulation
- Reduce negative compensations

Skelly et al. (1971). Compensatory physiologic phonetics for the glossectomee. 
Journal of Speech and Hearing Disorders, 36, 101-112.

- N=25 (14 totals and 11 partials)
- SLP Tx for all – started 9mos to 2 years post surgery
- Speech intelligibility assessed pre- and post-Tx
  - W-22 PB Word Lists
  - 3 listeners from pool of 27 listeners per subject
- Functional communication test

What did Skelly do?

- SLP Tx program – 12 months
- Non-speech exercises – “excursion”
- “drill for intelligibility” of vowels, consonants
- Exploring compensatory artic with remaining articulators
- Identifying those compensations that positively impact intelligibility
- Also did cinefluoroscopic studies of 5 patients

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<th>Example Activities</th>
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<tr>
<td>Reduction of oral and pharyngeal noises</td>
<td>Various throat relaxation activities (borrowed from singers)</td>
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<tr>
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<tr>
<td>Extension of pitch range</td>
<td>Pitch practice (habitual vowels, words, phrases, convo; variation: intonation exercises)</td>
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<tr>
<td>Improved resonance of higher harmonics</td>
<td>Various throat relaxation activities (borrowed from singers)</td>
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**Table 3.** Intelligibility summary, oral glossectomees. Note: Rank order in which patients were tested was determined by consensus of three staff speech pathologists. The dysphagic patients (9 through 15) were all considered to rank sixth.

<table>
<thead>
<tr>
<th>Clinician</th>
<th>Ranking of Patients</th>
<th>Pre</th>
<th>Post</th>
<th>Global Mean/N</th>
<th>Life Situation</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>16</td>
<td>45</td>
<td>100</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>24</td>
<td>42</td>
<td>90</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>12</td>
<td>58</td>
<td>80</td>
<td>50</td>
<td>50</td>
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<tr>
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<td>20</td>
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<tr>
<td>6</td>
<td>6</td>
<td>12</td>
<td>54</td>
<td>16</td>
<td>56</td>
<td>60</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>8</td>
<td>26</td>
<td>16</td>
<td>34</td>
<td>40</td>
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<tr>
<td>8</td>
<td>8</td>
<td>6</td>
<td>24</td>
<td>19</td>
<td>20</td>
<td>56</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>6</td>
<td>12</td>
<td>14</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>18</td>
<td>28</td>
<td>28</td>
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* Three patients dropped from program in the early stages.


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**Table 4.** Intelligibility summary, partial glossectomees.
Takatsu et al (2016)

- N=62; partial glossectomy, various reconstruction
- Assessed vowel space area and formant transition slopes for /a/, /i/, /u/
- Vowel space and formant slopes decreased pre-post surgery
- Post-SLP, increased space and slopes


- Systematic review re: SLP intervention outcomes with people who have partial glossectomy
  - 1422 articles screened
  - 76 reviewed
  - 7 met criteria for inclusion
- All were level III or IV (Oxford) – most were case series, one was quasi-experimental

Blythe et al

- Trends
  - Interventions varied
    - individually prescribed for compensations
    - range of motion
    - Other (some re: rate, voice, etc.)
  - Essentially all demonstrated improvement in intelligibility
    - Study quality generally low
    - Mixed Tx approaches within same participant

SLP Roles Post: Palatal Tumor

- Hard Palate = maxillary prosthetics
- Soft Palate = velopharyngeal prosthetics or flaps

SLP Roles Post: Palatal Tumor

Be on the Prosthetics Team

- Speech (and swallow) evals
  - Baseline
  - During construction as appropriate
  - Post final construction
- Focus
  - Nasal Escape/Resonance
  - Intelligibility, understandability

SLP Roles Post: Palatal Tumor

- Nasal Escape/Resonance
  - Perceptual ratings of
    - hypernasality = vowel phenomenon
    - nasal emission = consonant phenomenon
    - "audible burst on pressure consonant"
  - Instrumental Assessments
    - Flexible endoscopy of VP closure
    - Aerodynamic assessment

SLP Roles Post: Palatal Tumor

HYPERNASALITY (nas. escape)

1. Free oral air. /fa/ /a/ /o/ /u/ /i/ /s/ /l/ /r/ /th/ /f/
2. Free oral air. /s/ /l/ /e/ /i/ /a/ /u/ /o/ /h/ /th/ /f/ /g/
3. Quiet nasal air. /a/ /u/ /i/ /e/ /o/ /s/ /l/ /h/ /th/ /f/ /g/
4. Eaten food. /a/ /u/ /i/ /e/ /o/ /s/ /l/ /h/ /th/ /f/ /g/
5. Sleepy real stuff. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
6. Sleepy real stuff. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
7. Clear. quiet speech. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
8. Clear. quiet speech. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
9. Sleepy real stuff. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
10. Sleepy real stuff. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
11. Sleepy real stuff. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
12. Sleepy real stuff. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
13. Sleepy real stuff. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
14. Sleepy real stuff. /a/ /i/ /e/ /o/ /u/ /s/ /l/ /h/ /th/ /f/ /g/
SLP Role Post: Labial Cancer surgery

- Literature tells us what…? Essentially no empirical data published about effectiveness or efficacy of any intervention.
- Typically limited to no need for SLP involvement unless total labial resection/reconstruction.
- Our basis for intervention:
  - Logic and understanding of:
    - normal speech sound production
    - abilities of remaining articulators
  - Expert opinion

Questions