

1st Annual MSKCC Cancer Rehabilitation Symposium

Evaluation and Treatment Strategies for Radiation Fibrosis in Patients with Head and Neck Cancer


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Memorial Sloan-Kettering
Cancer Center

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Objectives

- Anatomy review
- Evaluation techniques
- Precautions and Contraindications
- Rehabilitation approach
- Lymphedema management of the head and neck



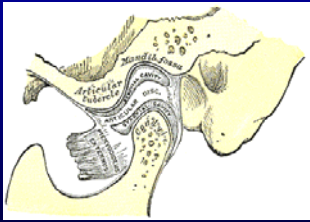
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Common Patient Complaints


- Headaches
- Difficulty chewing & eating
- Limited mouth opening
- Difficulty with oral hygiene
- Neck/shoulder pain & limited range of motion



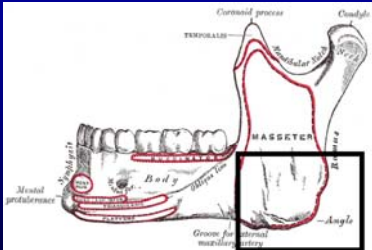
Temporomandibular Joint




<http://upload.wikimedia.org/wikipedia/commons/9/9c/Gray311.jpg>



Mandible




http://upload.wikimedia.org/wikipedia/commons/0/0d/Gray178_mandibular_angle.png




Muscles of Mastication

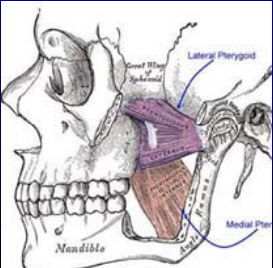
Action:
Elevate the mandible – close the mouth



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Muscles of Mastication




Medial pterygoid elevates the mandible; closes the mouth

Lateral pterygoid Pulls the head of the mandible forward; opens the mouth


http://www.doctorspiller.com/images/occlusion/pterygoids.jpg




Suprahyoid Musculature




Digastric: elevates the hyoid/depresses the mandible



Stylohyoid: elevates the hyoid during swallowing




Mylohyoid: elevates the hyoid/depresses the mandible



Geniohyoid: elevates hyoid during swallowing

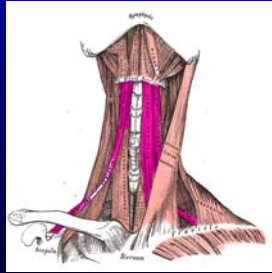
http://www.wikidoc.com/images/1/1d/Digastric_muscle.png http://en.wikipedia.org/wiki/File:Mylohyoid_muscle.PNG
 http://en.wikipedia.org/wiki/File:Stylohyoid_muscle.png http://en.wikipedia.org/wiki/File:Geniohyoid_muscle.PNG



Infrahyoid Musculature

- Sternothyroid
- Sternohyoid
- Thyrohyoid
- Omohyoid

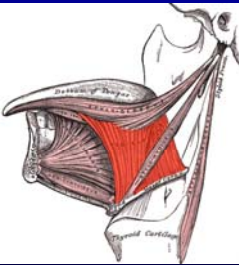
Action: Depress the hyoid during swallowing and speaking



http://en.wikipedia.org/wiki/File:Infrahyoid_muscles.png



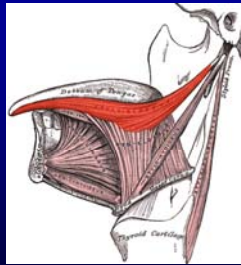
Sublingual Musculature



<http://en.wikipedia.org/wiki/File:Hyoglossus.png>

Hyoglossus

Action: Retract the tongue

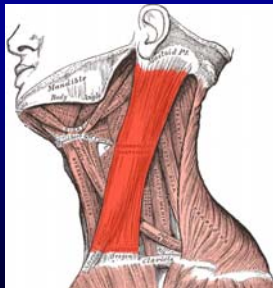


<http://en.wikipedia.org/wiki/File:Styloglossus.png>

Styloglossus



Sternocleidomastoid




<http://en.wikipedia.org/wiki/File:Sternocleidomastoidus.png>




A Functional Unit

a) Cranio-vertebral joints posteriorly




en.wikipedia.org/wiki/File:Service_ventricles_200903.png

b) TMJ anteriorly




http://en.wikipedia.org/wiki/File:Gray300.png



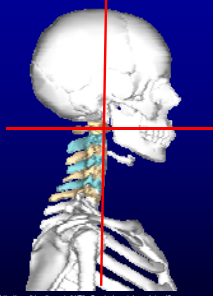
c) Connection via hyoid bone inferiorly

http://en.wikipedia.org/wiki/File:Skelloccidomastoidus.png




Craniovertebral Joints


- Temporomandibular Joint requires stability for optimal joint function/centricity.²
- Loss of centricity leads to parafunction due to asymmetric muscle activity.²
- Temporal bone should be horizontal in space to achieve joint centricity. This position is dependent on craniovertebral alignment.²



http://en.wikipedia.org/wiki/File:Craniocerv_ventricles_200903.png




Palpating Craniovertebral Functional Spaces




MSKCC photo

- CV functional spaces:
 - Occiput ↔ post. arch of atlas
 - Atlas ↔ axis
 - Axis ↔ C3
- Normal range:
 - 2 fingers between base of occiput and C2 spinous process
 - Approx 20 mm total space



Surgical Interventions

- Segmental mandibulectomy: Tumor invades the bone. A portion of the mandible is removed, sometimes replaced with bone graft or plate.
- Marginal mandibulectomy: Tumor does not invade the bone. A piece of bone is resected, the bone is not cut through.
- Maxillectomy: Tumor invades the hard palate which is then completely or partially removed. Maxillary defect may be covered by a prosthesis.
- Neck Dissection: Excision of lymph nodes of the neck.



Maxillectomy



MSKCC photo



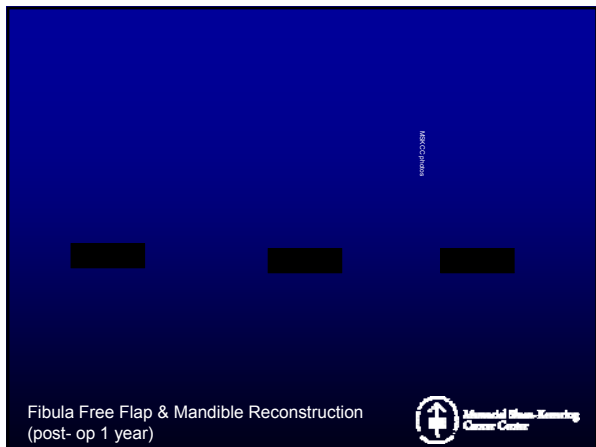
Surgical Reconstruction

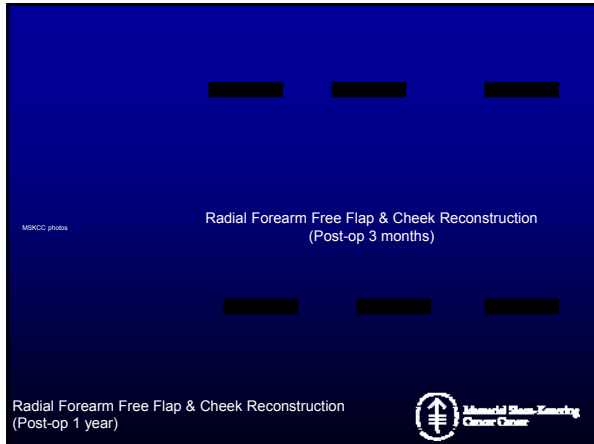
- Myocutaneous flap
- Free tissue transfers
- Bone grafts
- Prosthetics

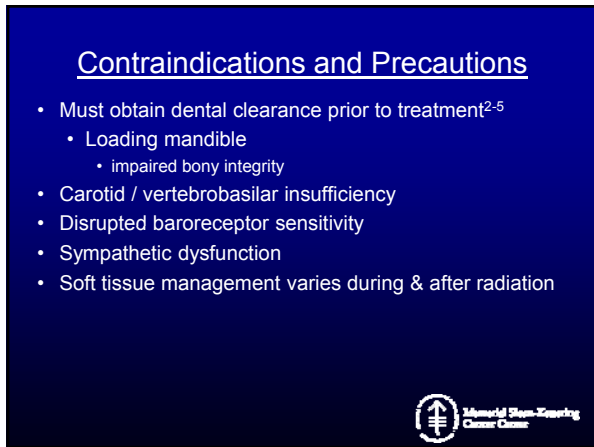


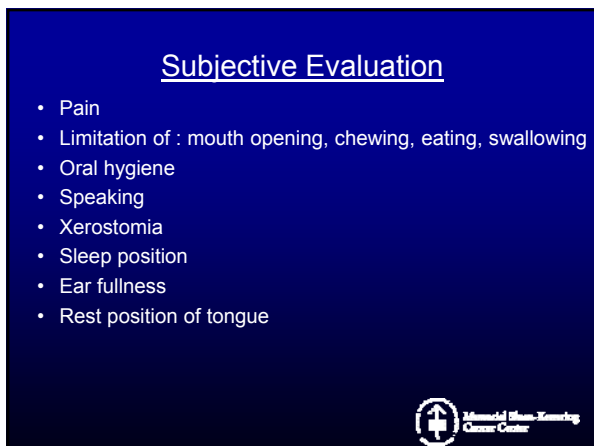














Objective Evaluation

- Observation
- Sensation
- Mobility
- Posture
- Circumferential measurements
- Motor control
- Palpation
- C/S and UE ROM




Standardized Tests

- Facial Disability Index
- Neck Disability Index
- REEDCO Posture Scale
- DASH




Observation

- Symmetry: lips, eyes, ears, nose
- Scars: well-healed, hypertrophic, hyper or hypopigmentation
- Edema
- Lip length



Observation


MRCC photos



Sensation


Paresthesias:

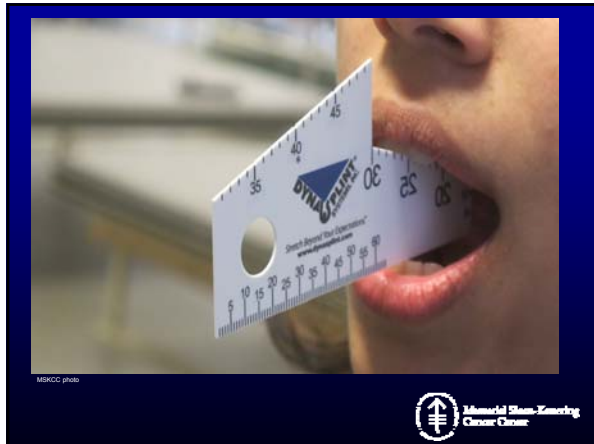
- Face
- Tongue
- Mouth



TMJ Mobility: Range of Motion

- Normal active mouth opening range: 35-50 mm²
- Opening and closing:
 - Check for deviations (corrects at end of movement) vs. deflection (does NOT correct @ end of movement)
 - Measure vertical distance between upper and lower central incisors using a ruler





TMJ Mobility: Range of Motion

Lateral deviation:

Measure deviation of the mandible using the space between the lower central incisors as a reference


TMJ Mobility: Range of Motion

Protrusion / Retrusion:²

- Measure horizontal distance between upper and lower central incisors
- 4:1:1 rule: lateral excursion & protrusion/retrusion amount to 1/4 of the opening range of motion, or ~ 8-10mm


Edema Measurements

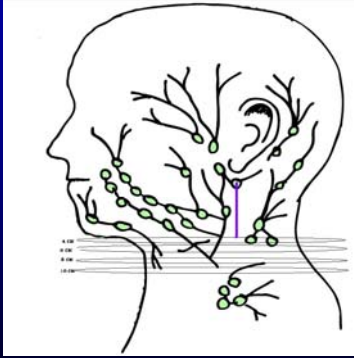
- Tragus of the ear to mental protuberance
- Tragus to mouth angle
- Mandibular angle to nasal wing
- Mandibular angle to internal eye corner
- Mandibular angle to external eye corner
- Mental protuberance to internal eye corner
- Mandibular angle to mental protuberance




Edema Measurements

- Circumferential measurements around neck
- Measure from point where inferior ear meets head
- Measure distally at following intervals:
 - 4 cm
 - 6 cm
 - 8 cm
 - 10cm






MSKCC photo




Edema Measurements


- Vertical measurement from crown of head (with tape measure just in front of ears) to under chin
- 7 cm below bottom of closed lips
- 10 cm below bottom of closed lips

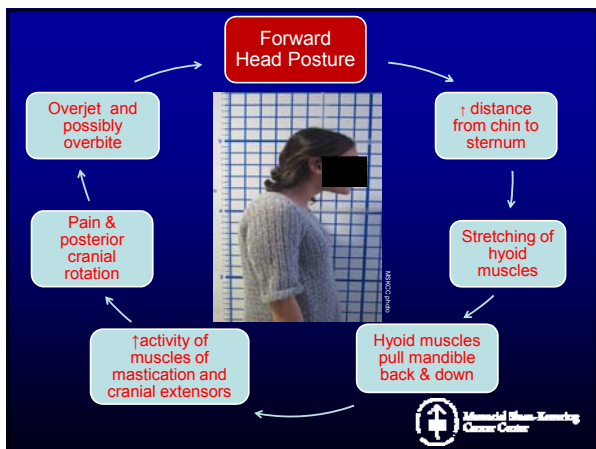


Posture



MSKCC photo





Normal Rest Position of the Mandible²

- Teeth slightly apart
- Lips gently closed
- Tongue placed on hard palate behind teeth



Physical Therapy Implications

- Nerve injury
 - Weakness
 - Pain
 - Paresthesias
- Lymphedema
- Compromised skin integrity
- Fatigue
- Nutrition
- Psychosocial implications




Physical Therapy Implications

- Radiation Induced Fibrosis⁵
 - Trismus
 - Limited cervical ROM
 - Atrophy/Head drop
 - Limited chest wall excursion
 - Rotator cuff tendonitis
 - Osteoradionecrosis
 - Neuralgia
 - PAIN



Treatment

- Multi-modal approach to improve range of motion of the cervical spine, TMJ, & the shoulder
- Improve
 - postural alignment
 - tissue mobility for ↓ pain & ↑ independence with daily activities



Treatment

- Active/Passive movements
 - Mouth opening/closing
 - Mandibular lateral deviation
 - Mandibular protrusion/retrusion
 - Cervical ROM
 - Shoulder ROM and strengthening





Therapeutic Exercise^{3,4}

<p>1 Exercises for the rest position of the tongue</p> <ul style="list-style-type: none">• Bring tongue up against the palate.• Tongue clucking• Practice correct breathing in this position (diaphragmatic). <p>▶ Helps place the tip of the tongue in correct position for swallowing & correct mandibular position of rest.</p>	<p>2 Exercises to control TMJ translation</p> <ul style="list-style-type: none">• Hold anterior part of tongue flat against the palate.• Open slowly• Practice chewing in this limited range, preferably in front of a mirror. <p>▶ Limits early translation (protrusion) and the amount of opening</p> <p>▶ Maintains an optimal position of the disc.</p>
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3 Mandibular rhythmic stabilization **4 Small Range neck flexion**



Apply light resistance to jaw during opening, closing, and lateral deviation with the jaw in a rest position

Upper cervical flexion (nodding):
Nod head ~15°



5 Chin Tuck **6 Exercises for shoulder girdle retraction**



• Draw shoulders backwards and down.
• May supplement with strengthening of lower trapezius and rhomboids.

All exercises should be pain-free!



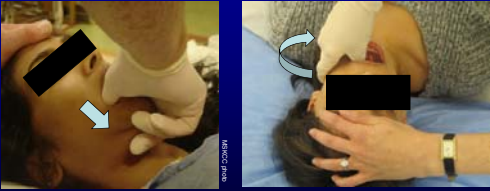
Manual Therapy Techniques

- Myofascial release
- Scar massage
- STM – include intraoral and sublingual
- Manual lymphatic drainage
- Cervical, thoracic, and hyoid mobilization
- Therapeutic taping:
 - Kinesiotape®
 - McConnell®




Manual Therapy Techniques^{3,4}

Especially important for hypomobility of the TMJ!




Distraction Lateral condylar glide



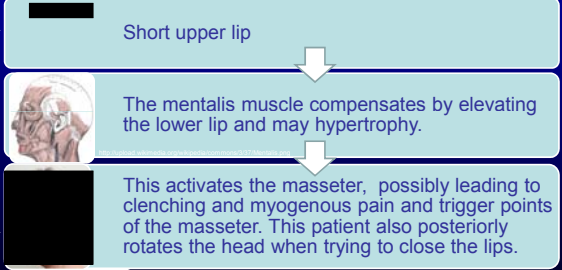
Tongue Mobility

- Tongue length must be sufficient to achieve normal resting position of the tongue up against the palate.²
- The tongue is intimately related to the position of the hyoid muscles and supra/infrahyoid activity.²
- Inferior tongue musculature may require stretching.²



Lip Mobility


Normally, the upper lip should cover 3/4 of the maxillary teeth.²⁻⁴



Short upper lip

The mentalis muscle compensates by elevating the lower lip and may hypertrophy.


This activates the masseter, possibly leading to clenching and myogenous pain and trigger points of the masseter. This patient also posteriorly rotates the head when trying to close the lips.



Rehabilitation Techniques

A full rehab program must also include:

- Postural re-education
- Shoulder girdle strengthening



Assistive Devices

Dynasplint
Min mouth opening required:
7 mm



LLP (Low-Load, Prolonged Duration) Therapy
enhances the neurologically treated function
of muscular control.

Mouthpiece is padded to provide
maximum comfort and safety.

Simple, adjustable
and portable for clinical
rehabilitation.

Available for
rent or purchase.

Key to use:
- Support head with
chin and neck.
- High posture.
- Relax jaw.

Blowing into
pneumatically
inflated device.

http://www.shulman-associates.com/pdf/TrialUse.pdf


Therabite
Min mouth opening required:
6-9 mm




http://www.3dmedical.us/Corporate/Products/Mouth_and_Jaw.html#
#FlexMouth_JawCatalog%20to%207927%20_therabite_200811.pdf

Lymphedema Management of the Head & Neck

	Edema	Lymphedema
Onset	Acute	Acute/subacute/chronic
Duration	Days/weeks	Chronic
Composition	Water	Protein-rich fluid
Management	Elevation	Complete decongestive therapy



Lymphedema Management of the Head & Neck

- Complete decongestive therapy¹
 - Manual Lymphatic drainage
 - Compression bandaging or garments
 - Meticulous skin care
 - Therapeutic exercise
 - Oral care



Lymphedema Contraindications

- Use caution:¹
 - when applying heat to the head and neck
 - over area of carotids
 - over stomas
- Defer treatment:¹
 - if radiation dermatitis is present
 - if acute infection is present



Sample Rehab Goals

- Increase mouth opening by 4 mm to improve:
 - ease of oral hygiene
 - tolerance for dental work
 - ability to eat larger pieces of food
- ↑ c/s ROM by 10° for improved environmental scanning
- ↓ incidence of headaches to 1x wk for improved tolerance for work-related tasks
- Independently don garment to ↓ re-accumulation of lymph




Sample Exercise Program

- Mouth opening/closing using mirror to attain midline mandibular alignment
- Mandibular lateral deviation/protrusion
- Active c/s stretching
- UE strengthening, scapular stabilization
- Postural re-education, core strengthening
- Tongue positioning, breathing
- Manual therapy → Self-massage
- Manual lymphatic drainage, compression garment, meticulous skin care




Conclusions

- Patients with head and neck cancer face a variety of challenges which affect their QOL.⁵
- Multiple systems are affected which physical therapy can address.
- Early intervention for patients who undergo cancer treatments can be beneficial in improving their QOL.⁵



Conclusions

- Radiation fibrosis and spinal accessory nerve damage are the primary impairments seen by PTs in this population.⁵
- Duration of PT intervention may be short-term or long-term.
- A need exists for future research in physical therapy intervention with patients who have head and neck cancer.



Thank You

- *Hanna Rimner*
- *Sharlynn Tuohy*
- *Ting-Ting Kuo*
- *Tulsi Patel*
- *Adriana Wong*



Resources

1. Chikly, B. *Silent Waves*. Upledger Institute, 2001
2. Rocabado M. & Iglarsh Z.A. *Musculoskeletal Approach to Maxillofacial Pain*. Philadelphia: Lippincott Williams & Wilkins, 1990.
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