Head & Neck Surgery Course

Oropharynx: surgical anatomy

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Introduction

Anatomy

- Mucosa
- Submucosa (lymphatic tissue of Waldayer ring!)
- Pharyngobasilar fascia
- Muscles
- Buccopharyngeal fascia (Middle Layer of the Deep Cervical Fascia)
Introduction

Physiology

- Swallowing
- Speech (articulation)
- Immunitary defense
Introduction

Relationship of oropharynx with naso- and hypopharynx

(posterior view)
Anatomy of the oropharynx

Boundaries

- Superior
- Anterior
- Lateral
- Posterior
- Inferior
Anatomy of the oropharynx

Boundaries

- Superior
  - Hard palate
- Anterior
- Lateral
- Posterior
- Inferior
Anatomy of the oropharynx

Boundaries

- Superior
- Anterior
- Lateral
- Posterior
- Inferior

- Oropharyngeal isthmus
- Palatoglossal arch
Anatomy of the oropharynx

Boundaries

- Superior
  - Palatopharyngeal arch
- Anterior
  - Palatine tonsil
- Lateral
- Posterior
- Inferior
Anatomy of the oropharynx

Boundaries

- Superior
- Anterior
- Lateral
- Posterior
- Inferior

- Second and third cervical vertebrae
Anatomy of the oropharynx

Boundaries

- Superior
  - Level of hyoid
- Anterior
  - Vallecula
- Lateral
- Posterior
- Inferior
Pharyngobasilar fascia
Pharyngeal constrictor muscles

- *Superior, middle, inferior*
Muscular Division

Verploegen infrahyoid strap muscles

Visceral Division

Envelopes
- Thyroid
- Trachea
- Esophagus
- Pharynx (Buccopharyngeal fascia)
- Larynx
Blood supply of the oropharynx
Blood supply of the oropharynx
Lymphatic drainage of the oropharynx

- 1st echelon nodes: levels II, III, IV
- Then: levels Ib, V
- Retropharyngeal nodes!
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
Innervation of the oropharynx

- Sensory, motor, parasympathetic innervation and taste
- V, VII, IX, X, XII CNs
- See sites of oropharynx
Sites of the oropharynx

4 sites

- Soft palate
- Tonsillar fossae
- Base of tongue
- Oropharyngeal walls
Sites of the oropharynx

Soft Palate: introduction

- 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
Sites of the oropharynx

Soft Palate: muscles
Sites of the oropharynx

Soft Palate: muscles

- Tensor veli palatini (V3)
- Levator veli palatini (X)
- Uvular (X)
- Palatoglossus (X)
- Palatopharyngeus (X)
Sites of the oropharynx

Soft Palate Vascular Supply

- Ascending palatine branch (APA) of facial artery
- Occasionally ascending pharyngeal artery (APhA)
- Venous drainage via pterygoid venous plexus
Sites of the oropharynx
Soft Palate innervation

- Maxillary nerve (V₂) → lesser palatine nerve
  - Somatic sensation anterior part of soft palate (V₂)
  - Greater petrosal nerve without synapsing in pterygopalatine ganglion → taste (VII)
  - Postganglionic branches from pterygopalatine ganglion → secretomotor

- Glossopharyngeal nerve (IX) → sensitive branches
  - Posterior part of soft palate (somatic sensation + taste)

- X nerve → muscles [all but tensor veli (V₃) ]

- Postganglionic sympathetics from carotid plexus
Sites of the oropharynx

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 $\rightarrow$ 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
Sites of the oropharynx

Palatine Tonsil: tonsillar fossa

- Anterior arch
  - Palatoglossal fold
  - Palatoglossus muscle (X)

- Posterior arch
  - Palatopharyngeal fold
  - Palatopharyngeus muscle (X)

- Lateral border
  - Superior constrictor (X)
  - Styloglossus (XII)
  - Anterior fibers of palatopharyngeus
Sites of the oropharynx

Palatine Tonsil: tonsillar fossa
Sites of the oropharynx

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
Sites of the oropharynx

Palatine Tonsil Vascular Supply
Sites of the oropharynx

Palatine Tonsil innervation

- Tonsillar plexus ("circulus tonsillaris")
  - Maxillary nerve (V2)
    - Passes through (not synapses) sphenopalatine ganglion
    - Distribute via lesser palatine nerves
  - Tonsillar branches from IX

- Referred otalgia from tympanic branch of glossopharyngeal nerve (Jacobson’s nerve)
Sites of the oropharynx

Palatine Tonsil innervation
Sites of the oropharynx

Palatine Tonsil innervation
Sites of the oropharynx
Pharyngeal wall: introduction

- Mucosa
- Submucosa
- Pharyngobasilar fascia
- Constrictor muscles
  - Superior constrictor (X)
  - Upper fibers of middle constrictor (X)
- Buccopharyngeal fascia
Sites of the oropharynx

Pharyngeal wall: introduction
Sites of the oropharynx

Pharyngeal wall: muscles
Sites of the oropharynx

Pharyngeal wall: muscles

- Auditory (pharyngo-tymppanic) tube: Cartilage Opening
- Pharyngobasilar fascia
- Levator veli palatini muscle
- Salpingopharyngeus muscle
- Soft palate
- Palatopharyngeus muscle
- Pharyngeal constrictor muscles: Superior Middle Inferior
- Stylopharyngeus muscle
- Internal branch of superior laryngeal nerve and superior laryngeal artery passing through thyrohyoid membrane
- Retropharyngeal space
- Cricopharyngeus portion of inferior pharyngeal constrictor muscle
- Tensor veli palatini muscle and tendon
- Nasal conchae: Superior Middle Inferior
- Medial pterygoid plate
- Hamulus of medial pterygoid plate
- Pharyngomandibular raphe
- Mandible
- Styloglossus muscle (cut)
- Stylohyoid ligament
- Hyoglossus muscle (cut)
- Epiglottis
- Hyoid bone, body
- Median thyrohyoid ligament
- Thyroid cartilage
- Arytenoid cartilage
- Vocal ligament
- Conus elasticus (ghosted)
- Median cricothyroid ligament
- Cricoid cartilage
- Esophagus
- Trachea
Sites of the oropharynx

Pharyngeal wall: muscles
Sites of the oropharynx

Pharyngeal wall

Vascular supply

- Pharyngeal branch of ascending pharyngeal artery
- Tonsillar branch of facial artery
- Venous drainage via pharyngeal plexus
Sites of the oropharynx

Pharyngeal wall
Sites of the oropharynx
Pharyngeal wall

Innervation

• Pharyngeal plexus
  – pharyngeal branches of IX and X CNs
  – Sensory innervation
  – Motor innervation for constrictor muscles (X), stylopharyngeal (IX) and palatopharyngeal (X)
Sites of the oropharynx

Pharyngeal wall

Superior pharyngeal constrictor muscle

Glossopharyngeal nerve (CN IX)

Buccinator muscle

Pterygomandibular raphe

Vagus nerve (CN X)

Styloglossus muscle

Stylohyoid ligament

Stylopharyngeus muscle

Hyoglossus muscle

Mylohyoid muscle

Digastric muscle, anterior belly

Middle pharyngeal constrictor muscle

Superior laryngeal nerve:
   Internal branch
   External branch

Inferior pharyngeal constrictor muscle:
   Cricopharyngeal part
   Cricothyroid muscle
   Right recurrent laryngeal nerve
   Esophagus

Pharyngeal tubercle

Pharyngeal constrictor muscles

Pharyngobasilar fascia

Accessory nerve (CN XI)

Stapedius muscle

Internal carotid artery

External carotid artery

Hypoglossal nerve (CN XII)

Superior cervical ganglion

Superior laryngeal nerve

Internal jugular vein (out)

Vagus nerve (CN X)

Common carotid artery

Sympathetic trunk

Middle cervical ganglion

Left recurrent laryngeal nerve

Inferior cervical ganglion

Right recurrent laryngeal nerve

Roof

Pharyngeal plexus containing contributions from:
   Vagus nerve
   Glossopharyngeal nerve
   Sympathetic fibers

Inferior pharyngeal constrictor muscles:
   Cricopharyngeal part

Thyroid gland

Inferior thyroid artery (out)

Sympathetic trunk

Middle cervical ganglion

Left recurrent laryngeal nerve

Inferior cervical ganglion

Right recurrent laryngeal nerve

Roof

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Sites of the oropharynx

Pharyngeal wall: *summary of vascular and neural supply*
Sites of the oropharynx

Base of Tongue

Anatomical relationships

• Circumvallate papillae (anteriorly)
• Pharyngoepiglottic fold (posteriorly)
• Glossoepiglottic fold (posteriorly)
• Palatine tonsils are lateral
Sites of the oropharynx

Base of Tongue: vascular supply

- Lingual artery
- Lingual vein
Sites of the oropharynx

Base of Tongue: innervation

- IX
  - Posterior third of tongue
  - Sensation and taste

- X
  - Superior Laryngeal nerve (internal branch) (sensation and taste of Vallecula)
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Oropharynx: surgical techniques

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Surgical options

**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
Transoral Surgical Approach

Lateral Oropharyngectomy

- Conservative resection of selective tonsillar SCCA
- Sometimes tracheostomy to secure airway
- Contraindications
  - Trismus or poor exposure
  - Tonsillar fixation to lateral oropharyngeal wall
  - Invasion
    - Bone (mandible or medial pterygoid plate)
    - Nasopharynx
    - Pharyngoepiglottic fold, Vallecula
    - Base of tongue
    - Pyriform sinus

(Holsinger 2005)
Transoral Surgical Approach

Lateral Oropharyngectomy
Transoral Surgical Approach

Lateral Oropharyngectomy
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 posterolateral to fascia
Posterior pharyngeal flaps as needed to prevent rhinolalia

Reconstruct complete soft palatectomy with obturator
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
Surgery
Mandibular Lingual Release
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
Surgery

Suprahyoid Pharyngotomoy
Surgery

Suprahyoid Pharyngotomy
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
Surgery

Lateral Pharyngotomy
Surgery
Lateral Pharyngotomy
Surgery

Midline Labiomandibular Glossotomy

- 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
Surgery
Midline Labiomandibular Glossotomy
Surgery
Mandibular Swing

• Wide local excision
  – Incise lip and floor of mouth
  – Mandibulotomy anterior to mental nerve
  – Dissect carotid and lingual and XII 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
Surgery
Mandibular Swing

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Surgery

Mandibular Swing

- Tonsil
- Tumor
- Incision
- Mental n.
- Osteotomy
Surgery
Mandibular Swing
Surgery

Mandibular Swing
Surgery
Mandibulectomy

• Composite resection
  – Incise lip and gingivobuccal sulcus (lower cheek flap)
  – 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
Surgery

Mandibulectomy
Surgery
Mandibulectomy
Surgery

Mandibulectomy