The Mouth and Oropharynx

MOUTH - GENERAL

From lips to palatoglossal fold (anterior pillar of fauces)
Vestibule is between teeth/gums and cheek. Emptied by buccinator
Roof is hard palate
Floor is tongue
Functions are eating, talking and extra airway
Sensations are taste, temperature, touch. Tongue/lips assess
Mucous membrane is stratified squamous. Nerve supply is Vb & Vc
(buccal, mental, infra-orbital). Contains salivary glands,
pierced by parotid duct (2nd upper molar tooth) and ducts
of glands

Teeth: 32. All but molars erupted by 13yrs.
Incisors 8
Canines 4
Premolars 8
Molars 8 (erupt approx 18yrs)
Deciduous: erupt 7-24 months
Teeth Ns: superior alveolar (Vb)
           inferior alveolar (Vc)
HARD PALATE

- Mucoperiosteum (mucosa + periosteum)
- Sharpey's fibres into pits on bone
- **Blood supply:** Greater palatine artery
- **Venous drainage:** Pterygoid plexus
- **Lymph:** Retropharyngeal and deep cervical nodes
- **Nerve supply:** Greater palatine and nasopalatine

SOFT PALATE

Consists of:
• Aponeurosis
• Tensor veli palatini
• Levator veli palatini
• Palatoglossus
• Palatopharyngeus
• Muscles of uvula
• Mucosa
• Mucous & serous glands
• A few taste buds

Epithelium: Stratified squamous
Blood: Lesser palatine (maxillary)
   Ascending palatine (facial)
   Palatine branch of ascending pharyngeal (external carotid)
Veins: Pharyngeal & pterygoid plexus
Lymph: Retropharyngeal & anterolateral deep cervical
Nerve: Secretomotor - Vb via pterygopalatine ganglion
   Sensation - Vb, lesser palatine + (IX)
   Taste - Greater petrosal then lesser palatine
Function: closes nasopharynx

Passavant's ridge is a circular, sphincter-like part of either palatopharyngeus or superior constrictor
SUBLINGUAL GLAND

- Mucous gland
- Between mylohyoid and genioglossus
- 15 ducts - 1/2 into submandibular duct
  1/2 into sublingual fold
- **Nerve supply:** secretomotor via submandibular ganglion
  general sensation via lingual (Vc)
- **Blood supply:** lingual artery & branches of submental artery
- **Develops:** from a groove in floor of mouth that becomes a tunnel.
  Blind end proliferates (ectodermal) to give secreting acini
- **(Note:** all salivary glands develop from epithelial lining of mouth)**
PAROTID GLAND 1

Lies between mastoid, styloid process, ramus of mandible. Surrounded by parotid fascia (investing layer of deep fascia)

- Serous secretions
- Produces amylase, water, Ig factors (lubricates & oral hygiene)
- Has an upper & lower pole, lateral, anterior & deep surface

RELATIONS:

**Posterior**
- Sternoceidomastoid
- Mastoid process

**Above**
- External acoustic meatus
- Temporomandibular joint

**Anterior**
- Angle of mandible
- Medial pterygoid plate
- Masseter
- Stylomandibular ligament

**In gland**:
- Facial nerve, retromandibular vein,
- external carotid artery, lymph nodes,
- fibres of auriculotemporal nerve

**Deep to gland**:
- Mastoid process, sterno-
- mastoid, posterior belly of digastric,
- styloid process, stylohyoid ligament &
- muscle, styloglossus, stylopharyngeus,
- tempormandibular joint

**Lateral**:
- Subcutaneous surface
PAROTID GLAND 2

- **Blood supply:** Branches of external carotid
- **Venous drainage:** To retromandibular
- **Lymph drainage:** Pre-auricular to deep cervical
- **Nerve supply:** Secretomotor via inferior salivary nucleus to glossopharyngeal nerve to its tympanic branch to lesser petrosal nerve to otic ganglion to auriculotemporal nerve. Sympathetics via superior cervical ganglion and external carotid artery. Sensation for gland - auriculotemporal (Vc), for fascia - great auricular (C2)
- **Duct:** 5cm long, crosses masseter, pierces buccinator at 3rd molar and mucosa at 2nd molar. Stenson's duct
- **Surface markings of duct:**

  ![Diagram of parotid gland](image)

  - Intertragic notch of ear
  - Philtrum

  **Relations in axial section**
  - Carotid sheath
  - Posterior digastric
  - Mastoid
  - Sternocleidomastoid
  - Deep surface
  - Stylomandibular ligament
  - Medial pterygoid
  - Mandible
  - Masseter
  - Facial nerve
  - Lateral surface

  *Styloid process, stylohyoid, styloglossus, stylopharyngeus, stylohyoid and stylomandibular ligaments*

  **Development**
  - Lining of mouth
  - Ectoderm
  - Tunnel
  - Far end proliferates

  **Histology**
  - Stratified cuboidal ducts
  - Tubulo-acinar glands with the occasional myoepitheliocyte
CLINICAL ASPECTS

- Mickulitz & Sjorgren's syndromes
- Adenomas
  - Both sexes equal occurrence
  - Pleomorphic
  - Poorly circumscribed
  - Can become malignant
  - Usually superficial to VII
- Adenolymphoma - Warthin's tumour (more in males than females)
- Primary malignant - adenocystic, acinar cell
- Secondary malignant - from face
- Stones in duct
- Frey's syndrome - gustatory sweating. Regrowth of parasympathetic fibres into damaged sympathetic fibres in the auriculotemporal nerve
PAROTID GLAND 1

- Auriculotemporal n
- Superficial temporal art/v
- Facial n
- Facial v
- Buccinator
- Masseter
- Facial art
- Hypoglossal n (XII)
- External jugular v
- Sternomastoid

Lies between mastoid, styloid process, ramus of mandible.
Surrounded by parotid fascia (investing layer of deep fascia)

- Serous secretions
- Produces amylase, water, Ig factors (lubricates & oral hygiene)
- Has an upper & lower pole, lateral, anterior & deep surface

RELATIONS:

**Posterior**
- Sternocleidomastoid
- Mastoid process

**Above**
- External acoustic meatus
- Temporomandibular joint

**Anterior**
- Angle of mandible
- Medial pterygoid plate
- Masseter
- Stylomandibular ligament

**In gland:** Facial nerve, retromandibular vein, external carotid artery, lymph nodes, fibres of auriculotemporal nerve

**Deep to gland:** Mastoid process, sternomastoid, posterior belly of digastric, styloid process, stylohyoid ligament & muscle, styloglossus, stylopharyngeus, temporomandibular joint

**Lateral:** subcutaneous surface
### TEETH - 2

<table>
<thead>
<tr>
<th>ADULT NUMBER</th>
<th>INCISOR</th>
<th>CANINE</th>
<th>PREMOLAR</th>
<th>MOLAR</th>
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<tbody>
<tr>
<td>NUMBER</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>lower 3 upper</td>
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<tr>
<td>ROOTS</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2     3</td>
</tr>
<tr>
<td>CUSPS</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5     4</td>
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</tbody>
</table>

**TOTAL IN ADULTS**: $8 \times 2 = 16 \times 2 = 32$

### ERUPTIONS

<table>
<thead>
<tr>
<th></th>
<th>Incisors</th>
<th>Canines</th>
<th>Premolars</th>
<th>Molars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deciduous</td>
<td>7 8</td>
<td>18</td>
<td></td>
<td>12 24</td>
</tr>
<tr>
<td>(5x2=10x2=20)</td>
<td>6 9</td>
<td>18</td>
<td></td>
<td>12 24</td>
</tr>
<tr>
<td>Permanent</td>
<td>7 8</td>
<td>11</td>
<td>9 10</td>
<td>6 12 18+</td>
</tr>
<tr>
<td></td>
<td>7 8</td>
<td>11</td>
<td>9 10</td>
<td>6 12 18+</td>
</tr>
</tbody>
</table>

**Nerve & Blood Supply**

- Anterior/middle/posterior superior alveolar arteries & nerves
- Inferior alveolar artery/nerve

**Note**: The further back anaesthesia is needed the more a nerve block is required and the less efficient is local infiltration because of bone porosity.
# TONGUE - SENSATION & TASTE

## SUMMARY OF NERVE SUPPLY TO TONGUE

<table>
<thead>
<tr>
<th>SOMATIC SENSATION</th>
<th>TASTE</th>
<th>SECRETOMOTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANTERIOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/3</td>
<td>Lingual (Vc)</td>
<td>Chorda tympani (VII)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(anterior lingual glands)</td>
</tr>
<tr>
<td><strong>POSTERIOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/3 + vallate papillae</td>
<td>Glosso-pharyngeal (IX)</td>
<td>Glosso-pharyngeal (IX)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VALLECOULAE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glosso-pharyngeal (IX)</td>
<td>Glosso-pharyngeal (IX)</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note: Sympathetic supply to tongue is from superior cervical ganglion via lingual artery

FORMATION OF THE TONGUE

FLOOR OF PHARYNX (PHARYNGEAL ARCHES)

Lingual swellings with tuberculum impar give anterior 2/3 of tongue

5 Weeks

Tuberculum impar
Foramen caecum
Epiglottal swelling from 4th arch giving epiglottis

Copula (hypobranchial eminence), mostly 3rd arch, gives posterior 1/3 of tongue

Mesoderm between both 1st & 2nd arches gives anterior 2/3 of tongue

5 months

Foramen caecum
Epiglottal swelling from 4th arch giving epiglottis

Posterior 1/3 From 2nd, 3rd & 4th arches (2nd is overgrown)

Palatine tonsil

Epithelium & glands are from arch endoderm, muscles are from occipital myotomes/somites that migrate with the hypoglossal nerve

NERVES

Anterior 2/3 Mandibular division of trigeminal (Vc). 1st arch nerve
Chorda tympani for taste. Only remnant of 2nd arch

Posterior 1/3 Glossopharyngeal (IX). 3rd arch nerve
Internal branch of superior laryngeal branch of vagus which is 4th arch nerve

Redrawn, with permission, from Sadler T.W. Langman’s Medical Embryology. 11th ed. Baltimore: Lippincott Williams & Wilkins; 2010
1. Tensor palati
2. Levator palati
3. Buccinator & superior constrictor from pterygomandibular raphe
4. Styloglossus
5. Stylopharyngeus
6. Rectus capitis lateralis
7. Stylohyoid
8. Inferior oblique
9. Middle constrictor
10. Thyropharyngeus
11. Transverse process of axis
12. Transverse process of atlas
13. Superior oblique
14. Hyoglossus
15. Genioglossus
16. Geniohyoid/mylohyoid
17. Cricothyroid
18. Thyrohyoid membrane
TONGUE - MUSCLES

Hyoglossus
   Hypoglossal nerve (XII)
Genioglossus
   Hypoglossal nerve (XII)
Styloglossus
   Hypoglossal nerve (XII)
Palatoglossus
   Pharyngeal plexus (IX, X & sympathetic)

Intrinsic muscles
   Superior/inferior longitudinal, transverse & vertical
   Not attached to bone
   Hypoglossal nerve (XII)

Note: All muscles are supplied by hypoglossal nerve except palatoglossus

TONGUE - GENERAL TOPOGRAPHY

The tongue is a mass of skeletal muscle covered by mucous membrane. It is divided functionally and embryologically into an anterior 2/3 and a posterior 1/3 by the sulcus terminalis.

POSTERIOR 1/3:
- Oropharynx. smooth mucosa for swallowing
- No papillae. Lingual tonsil.
- Serous/mucous glands

ANTERIOR 2/3:
- Oral. Papillae (filiform, fungiform & vallate) for grip/taste.
- Glands on tip and sides only
- Stratified, keratinising squamous epithelium

PAPILLAE
- Filiform for grip, keratin tips - pink after chewing, white then brown when dry
- Fungiform Taste buds
- Vallate with crypts for taste and serous glands
TONGUE - LINGUAL ARTERY

- Hypoglossal nerve (XII)
- External carotid artery
- Dorsal lingual arteries
- Lingual artery deep to hyoglossus
- Branch to sublingual gland
- Deep lingual v joins sublingual v to join lingual, facial or internal jugular

LYMPH
- Tip to submentum bilaterally
- Dorsum to submandibular mostly unilaterally
- Posterior to jugulo-omohyoid & deep cervical
OROPHARYNX

- **From:** lower border of soft palate
- **To:** upper border of epiglottis
- **Anterior:** posterior aspect of tongue & palatoglossal arch
- **Posterior:** 3 constrictors & C2/C3 vertebrae
- **Inferior:** back of tongue, lingual tonsil & valleculae
- **Lateral:** palatoglossal/palatopharyngeal arches, constrictors & palatine (the) tonsil
- **Lining:** squamous epithelium
- **Nerves:** glossopharyngeal (IX) & internal laryngeal (X) in valleculae
- **Features:**
  - Palatine tonsils (see separate illustration)
  - Lingual tonsils
  - Valleculae

Right side of oropharynx

GAG REFLEX
Sensory: IX
Motor: X
(pharyngeal plexus to palate muscles)
PALATINE TONSIL

- Lymphoid tissue in tonsillar fossa
- **Anterior/posterior:** palatoglossal/palatopharyngeal arches
- **Superior:** soft palate
- **Inferior:** tongue
- **Medial:** mucosa & 20 tonsillar crypts, intratonsillar cleft (this is a large crypt from 2nd pharyngeal pouch)
- **Bed:** submucosa (capsule), superior constrictor, facial artery & its branches
- **Lymph:** to deep cervical & jugulodigastric
- **Veins:** plexus in capsule to pharyngeal venous plexus. Also external palatine (paratonsillar) from soft palate
- **Nerves:** tonsillar branch of glossopharyngeal (IX) - hence referred pain to the middle ear. Also lesser palatine (maxillary via pterygopalatine ganglion)
- **Development:** 2nd pharyngeal pouch endoderm gives mucosa & crypts
  - Surrounding mesenchyme gives lymphoid tissue
- **Surface marking:** medial to lower masseter

**BLOOD SUPPLY**

- Carotid sheath (2.5 cm postero-lateral)
- Looking down at right tonsil
  - Posterior
  - Palatopharyngeus
  - Ascending pharyngeal artery
  - Palatoglossus
  - Lingual artery

- Lateral
  - Superior constrictor
  - Anterior
  - Ascending palatine & tonsillar brs of facial artery
WALDEYER'S RING

An interrupted circle of protective lymphoid tissue at the upper ends of the respiratory and alimentary tracts

- Upper midline in nasopharynx
- Around openings of auditory tube
- Either side of oropharynx
- Under mucosa of posterior third of tongue

Diagram:
- Pharyngeal tonsil (adenoid)
- Tubal tonsil
- Palatine tonsil
- Lingual tonsil
<table>
<thead>
<tr>
<th>ALL MUSCLES OF</th>
<th>SUPPLIED BY</th>
<th>EXCEPT</th>
<th>WHICH IS SUPPLIED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHARYNX</td>
<td>Pharyngeal plexus (IX, X &amp; sympathetic)</td>
<td>Stylopharyngeus</td>
<td>Glossopharyngeal (IX)</td>
</tr>
<tr>
<td>PALATE</td>
<td>Pharyngeal plexus (IX, X &amp; sympathetic)</td>
<td>Tensor veli palatini</td>
<td>Nerve to medial pterygoid (Vc)</td>
</tr>
<tr>
<td>TONGUE</td>
<td>Hypoglossal (XII)</td>
<td>Palatoglossus</td>
<td>Pharyngeal plexus (IX, X &amp; sympathetic)</td>
</tr>
<tr>
<td>FACIAL EXPRESSION &amp; BUCCINATOR</td>
<td>Facial (VII)</td>
<td>Levator palpebrae superioris</td>
<td>Oculomotor (III)</td>
</tr>
<tr>
<td>MASTICATION</td>
<td>Mandibular division of Trigeminal (Vc)</td>
<td>Buccinator</td>
<td>Facial (VII)</td>
</tr>
<tr>
<td>LARYNX</td>
<td>Recurrent laryngeal</td>
<td>Cricothyroid</td>
<td>External branch of superior laryngeal nerve (X)</td>
</tr>
</tbody>
</table>