Infratemporal fossa

Omid Moztarzadeh

Infratemporal fossa

The temporal fossa is superior to the infratemporal fossa, above the zygomatic arch, and communicates with the infratemporal fossa below through the gap between the zygomatic arch and the more medial surface of the skull



The infratemporal fossa is a wedge-shaped space deep to the masseter muscle and the underlying ramus of the mandible





Walls of the infratemporal fossa



- Superior (roof) :
 - Infratemporal surface of the greater wing of the sphenoid bone (foramen ovale a spinosum) and temporal bone (petrotympanic fissure)
- Medial:
 - Lateral plate of the pterygoid process (ventrally) + pharynx and two muscles of soft palate- tensor and levator veli palatini (Dorsally)

• Ventral:

. Tuber maxillae (maxillary tuberosity) – posterior superior alveolar foramens. upper part opens as the inferior orbital fissure into the orbit

• Lateral:

. Medial surface of ramus of the mandible (mandibular foramen) with processes

• Dorsal:

Styloid septum (the carotid sheath and its contents)

• Inferior:

. No anatomic floor.fossa ends where the medial pterygoid m. attaches to the mandible, submandibular gland





Lateral wall

The medial surface of the ramus of the mandible is the lateral wall of the infratemporal fossa.

Its most distinctive feature is the mandibular foramen, which is the superior opening of the mandibular canal. The inferior alveolar nerve and vessels pass through this foramen.

Immediately anterosuperior to the mandibular foramen is a triangular elevation (the lingula) for attachment of the mandibular end of the sphenomandibular ligament.

An elongate groove (the mylohyoid groove) extends anteroinferiorly from the mandibular foramen. The nerve to the mylohyoid is in this groove.

Posteroinferior to the mylohyoid groove and mandibular foramen, the medial surface of the ramus of the mandible is roughened for attachment of the **medial pterygoid muscle**



- Lateral pterygoid muscle
- Medial pterygoid muscle
- **Tendon of temporal muscle**
- Mandibular nerve and its branches
- **Otic ganglion**
- Maxillary artery mandibular and pterygoid parts and its branches
- **Pterygoid venous plexus**
- Chorda tympani
- Part of the parotid gland
- **Corpus adiposum**
- Sphenomandibular ligament



Lateral pterygoid muscle

Medial pterygoid muscle

Tendon of temporal muscle

Mandibular nerve and its branches

Otic ganglion

Maxillary artery - mandibular and pterygoid parts and its branches

Pterygoid venous plexus

Chorda tympani

Part of the parotid gland

Corpus adiposum

Sphenomandibular ligament - is an extracapsular ligament of the temporomandibular joint. Origin: the spine of the sphenoid bone and insertion: lingula of the mandible and the posterior margin of the mandibular foramen



Lateral pterygoid muscle : triangular shape (superior head: lateral to the foramen ovale and foramen spinosum, inferior head : passes between the cranial attachments of the two heads of the medial pterygoid)

Medial pterygoid muscle: quadrangular shape (superficial head and deep head)

Tendon of temporal muscle

Mandibular nerve and its branches

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Table 6.7 Lateral and medial pterygoid muscles

Muscle		Origin	Insertion	Innervation	Action
Lateral pterygoid	⑤ Superior (upper) head	Greater wing of sphenoid bone (infratemporal crest)	Mandible (pterygoid fovea) and temporomandibular joint (articular disk)	Lateral pterygoid nerve (anterior division of CN V ₃)	<i>Bilateral:</i> Protrudes mandible (pulls articular disk forward) and opens mouth. <i>Unilateral:</i> Alternating actions, along with ipsilateral medial pterygoid, result in side-to-side movements necessary for grinding.
	⊚ Inferior (lower) head	Lateral pterygoid plate (lateral surface)	Mandible (pterygoid fovea and condylar process) and neck of mandible		
Medial pterygoid	⑦ Superficial (external) head	Maxilla (maxillary tuberosity) and palatine bone (pyramidal process)	Pterygoid rugosity on medial surface of the mandibular angle	Medial pterygoid nerve (trunk of CN V ₃)	<i>Bilateral:</i> Elevation of mandible; also acts with lateral pterygoid to assist in protrusion of mandible. <i>Unilateral:</i> Acts with ipsilateral lateral pterygoid to protrude mandible and produce medial movement toward the opposite side. Alternating actions between right and left sides results in side-to-side chewing movements.
	⑧ Deep (internal) head	Medial surface of lateral pterygoid plate and pterygoid fossa			

Lateral pterygoid muscle : triangular shape (superior head: lateral to the foramen ovale and foramen spinosum, inferior head : passes between the cranial attachments of the two heads of the medial pterygoid)

Medial pterygoid muscle: quadrangular shape (superficial head and deep head)

Tendon of temporal muscle

Mandibular nerve and its branches: All branches of the mandibular nerve $[V_3]$ originate in the infratemporal fossa. V3 runs vertically through the foramen ovale and enters the infratemporal fossa between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle.

Otic ganglion

Maxillary artery - mandibular and pterygoid parts and its branches

Pterygoid venous plexus

Chorda tympani

Part of the parotid gland

Corpus adiposum

Sphenomandibular ligament - is an extracapsular ligament of the temporomandibular joint. Origin: the spine of the sphenoid bone and insertion: the lingula of the mandible and the posterior margin of the mandibular foramen



Branches of V3: Nerves supplying the muscles of mastication – ant. + post. temporal nn, masseteric n., nerve to lateral and medial pterygoid mm plus two tensor muscles: 1) tensor veli palatini and 2) tensor tympani.

Meningeal n, auriculotemporal n, inferior alveolar n. (between lateral and madial pterygoid mm), lingual n., buccal n.(runs on anterior margin of the tendon of the temporal m. down and forward and continue on the external surface of the buccinator m).



The buccal nerve passes laterally between the upper and lower heads of the lateral pterygoid and then descends around the anterior margin of the insertion of the temporalis muscle to the anterior margin of the ramus of the mandible, often slipping through the tendon of the temporalis. It continues into the cheek lateral to the buccinator muscle to supply general sensory nerves to the adjacent skin and oral mucosa and the buccal gingivae of the lower molars.

The lingual nerve first descends between the tensor veli palatini muscle and the lateral pterygoid muscle, where it is joined by the chorda tympani nerve, and then descends across the lateral surface of the medial pterygoid muscle to enter the oral cavity.



Lateral pterygoid muscle : triangular shape (superior head: lateral to the foramen ovale and foramen spinosum, inferior head : passes between the cranial attachments of the two heads of the medial pterygoid)

Medial pterygoid muscle: quadrangular shape (superficial head and deep head)

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Otic ganglion

Maxillary artery - mandibular and pterygoid parts and its branches

Pterygoid venous plexus

Chorda tympani - It leaves the middle ear through the medial end of the petrotympanic fissure, enters the infratemporal fossa, descends medial to the spine of the sphenoid and then to the lateral pterygoid muscle, and joins the lingual nerve

Part of the parotid gland

Corpus adiposum

Sphenomandibular ligament - is an extracapsular ligament of the temporomandibular joint. Origin: the spine of the sphenoid bone and insertion: the lingula of the mandible and the posterior margin of the mandibular foramen



Lingual nerve injury

- A lingual nerve injury proximal to where the chorda tympani joins it in the infratemporal fossa will produce loss of general sensation from the anterior two-thirds of the tongue, oral mucosa, gingivae, the lower lip, and the chin.
- If a lingual nerve lesion is distal to the site where it is joined by the chorda tympani, secretion from the salivary glands below the oral fissure and taste from the anterior twothirds of the tongue will also be lost.

Lateral pterygoid muscle : triangular shape (superior head: lateral to the foramen ovale and foramen spinosum, inferior head : passes between the cranial attachments of the two heads of the medial pterygoid)

Medial pterygoid muscle: quadrangular shape (superficial head and deep head)

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Otic ganglion

Maxillary artery - mandibular and pterygoid parts and its branches: The maxillary artery originates within the substance of the parotid gland and then passes forward, between the neck of the mandible and sphenomandibular ligament, into the infratemporal fossa. It ascends obliquely through the infratemporal fossa to enter the pterygopalatine fossa by passing through the pterygomaxillary fissure

Pterygoid venous plexus

Chorda tympani - It leaves the middle ear through the medial end of the petrotympanic fissure, enters the infratemporal fossa, descends medial to the spine of the sphenoid and then to the lateral pterygoid muscle, and joins the lingual nerve



Part of the parotid gland

Corpus adiposum

Sphenomandibular ligament - is an extracapsular ligament of the temporomandibular joint. Origin: the spine of the sphenoid bone and insertion: the lingula of the mandible and the posterior margin of the mandibular foramen

Maxillary artery reaches into the infratemporal fossa between mandibular neck and sphenomandibular ligament



Infratemporal Region

Classification of maxillary artery (M) as superficial (a) and deep (b) according to lateral pterygoid (LP)



Branches of maxillary artery:

Mandibular(1st) part: deep auricular (da), anterior tympanic (at), middle meningeal (mm), accessory middle meningeal (amm), inferior alveolar (ia)

Pterygoid(2nd) part: buccal (b), anterior and posterior deep temporal (dt), masseteric, arteries to lateral and medial pterygoid muscles.

Buccal artery runs between two heads of the lateral pterygoid muscles down and has a close relationship to the anterior margin of the ramus of the mandible



Anterior tympanic artery: same area as deep auricular a. passes superiorly immediately posterior to the TMJ, enter the tympanic cavity through the petrotympanic fissure.



Maxillary artery



Lateral pterygoid muscle : triangular shape (superior head: lateral to the foramen ovale and foramen spinosum, inferior head : passes between the cranial attachments of the two heads of the medial pterygoid)

Medial pterygoid muscle: quadrangular shape (superficial head and deep head)

Tendon of temporal muscle

Mandibular nerve and its branches: All branches of the mandibular nerve $[V_3]$ originate in the infratemporal fossa. V3 runs vertically through the foramen ovale and enters the infratemporal fossa between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle.

Otic ganglion

Maxillary artery - mandibular and pterygoid parts and its branches: The maxillary artery originates within the substance of the parotid gland and then passes forward, between the neck of the mandible and sphenomandibular ligament, into the infratemporal fossa. It ascends obliquely through the infratemporal fossa to enter the pterygopalatine fossa by passing through the pterygomaxillary fissure

Pterygoid venous plexus: is a network of veins between the medial and lateral pterygoid muscles, and between the lateral pterygoid and temporalis muscles.

Chorda tympani - It leaves the middle ear through the medial end of the petrotympanic fissure, enters the infratemporal fossa, descends medial to the spine of the sphenoid and then to the lateral pterygoid muscle, and joins the lingual nerve

Part of the parotid gland

Corpus adiposum

Sphenomandibular ligament - is an extracapsular ligament of the temporomandibular joint. Origin: the spine of the sphenoid bone and insertion: the lingula of the mandible and the posterior margin of the mandibular foramen



Pterygoid venous plexus

Significantly, small emissary veins often connect the pterygoid plexus in the infratemporal fossa to the cavernous sinus in the cranial cavity. These emissary veins, which pass mainly through the foramen ovale, are a route by which **infections can spread** into the cranial cavity from structures, such as the teeth, that are drained by the pterygoid plexus.

Also, because there are no valves in veins of the head and neck, **anesthetic** inadvertently injected under pressure into veins of the pterygoid plexus can backflow into tissues or into the cranial cavity.

The pterygoid plexus connects:

- posteriorly, via a short maxillary vein, with the retromandibular vein in the neck; and
- anteriorly, via a deep facial vein, with the facial vein on the face.



The danger triangle of the face

Omid Moztarzadeh

The danger triangle of the face consists of the area from the corners of the mouth to the bridge of the nose, including the nose and maxilla











This is what happened in 2006 with a 17 year old dying from this condition



the <u>veins</u> of the head do not contain one-way valves like other veins of the circulatory system



Cavernous sinus thrombosis is usually caused by a bacterial infection that has spread from the sinuses, teeth, ears, eyes, nose, or skin of the face.



It shows an MRI from a teenage girl with severe sinusitis. The complication is clotting of the veins of her left eye, and clotting of a large venous area inside the skull – the *cavernous sinus* (orange arrows).

She was hospitalized for intravenous antibiotics for severe sinusitis, and otitis. When she began to complain of vision changes this MRI was obtained. Visual testing revealed that she was losing the sight in her left eye.





Classic presentations are abrupt onset of unilateral periorbital <u>edema</u>, <u>headache</u>, <u>photophobia</u>, and bulging of the eye (<u>proptosis</u>).

Other common signs and symptoms include:

Ptosis, chemosis, (III, IV, V, VI). Sixth nerve palsy is the most common. Sensory deficits of the ophthalmic and maxillary branch of the fifth nerve are common. Periorbital sensory loss and impaired corneal reflex may be noted. Papilledema, retinal hemorrhages, and decreased visual acuity and blindness may occur from venous congestion within the retina. Fever, tachycardia and sepsis may be present. Headache with nuchal rigidity may occur. Pupil may be dilated and sluggishly reactive. Infection can spread to contralateral cavernous sinus within 24–48 hours of initial presentation.


Pterygoid venous plexus (normally is embedded between medial and lateral pterygoids) extended dorsally, reaches between articular disc of TMJ and external acoustic meatus and forms Zenker retroauricular plastic pad which has a significant function in the movements of the mandibular head.



Retroarticular Zenker plastic pad

- The pad is responsible for stabilizing the disc on the condyle and supplying the joint
- On opening
- By moving head of the mandible forward a Zenker plastic pad of retrodiscal tissue filled the space between the posterior thick part of the disc and the condyle as a result of negative pressure between the articular capsule and neck of the mandible in one side and external acoustic meatus in other side
- On closing
- By returning of the head of the mandible backward the blood is pushed out to the retromandibular vein

Otic ganglion: located medial to the mandibular n., between mandibular nerve and tensor veli palatini m., under oval foramen





Content





- Ventrally and caudally under maxillary tuberosity communicates with submandibular region.
- Laterally from maxillary tuberosity along lateral surface of the buccinator m. with buccal region.
- Medially with the pterygopalatine fossa through pterygomaxillary fissure
- Through formen spinosum with epidural space and middle cranial fossa
- Through inferior orbital fissure with orbital region.
- Through oval foramen via pterygoid plexus with the cavernous sinus and middle cranial fossa
- Superiorly deep to zygomatic arch to the temporal fossa

Pterygopalatine fossa

Omid Moztarzadeh

Pterygopalatine fossa

Is ventromedial continuation of the infratemporal fossa

The pterygopalatine fossa is a small inverted pyramidal space just inferior to the apex of the orbit.

It is continuous with the infratemporal fossa through the pterygopmaxillary fissure

The pterygopalatine fossa is a crossroads for neurovascular structures traveling between the

middle cranial fossa,

infratemporal fossa,

floor of orbit,

lateral wall of the nasal cavity,

oropharynx, and

roof of the oral cavity



Borders of the pterygopalatine Fossa

Anterior wall: *maxillary tuberosity* – infratemporal surface

Posterior wall: *pterygoid process* – anterior margin

Medial wall: *perpendicular plate of palatine bone*

Lateral wall: is open to the *infratemporal fossa through pterygomaxillary fissure*

Roof: greater wing of the sphenoid bone – maxillary surface



Contents

Because of its strategic location, the pterygopalatine fossa is a major site of distribution for the maxillary nerve $[V_2]$ and for the terminal part of the maxillary artery. It also contains the pterygopalatine ganglion where preganglionic parasympathetic fibers originating in the facial nerve [VII] synapse with postganglionic parasympathetic fibers and these fibers, along with sympathetic fibers originating from the T1 spinal cord level join branches of the maxillary nerve [V₂].

All the upper teeth receive their innervation and blood supply from the maxillary nerve $[V_2]$ and the terminal part of the maxillary artery, respectively, that pass through the pterygopalatine fossa.



Communication

Sphenopalatine foramen: medial part of fossa to the nasal cavity. Sphenopalatin a. + v. and lateral and medial superior posterior nasal branches

Greater palatine canal (pterygopalatine canal): inferior part of fossa to hard and soft palate (oral cavity). Greater palatine nerve and descending palatine artery



Communication

Foramen rotundum: sup. and posterolateral part of fossa to middle cranial fossa. Maxillary nerve

Pterygoid canal (vidian canal): post. Part of fossa inferior and medial to for. Rotundum to foramen lacerum (middle cranial fossa). Nerves of the pterygoid canal – (greater and deep petrosal nerves) and artery of the pterygoid canal

Pharyngeal canal (palatovaginal): (inferoposteriorly) posteromedial part of fossa medial to pterygoid canal to nasopharynx (pharyngeal br of CNV2 and pharyngeal aa.)





Communication laterally

Pterygomaxillary fissure: between infratemporal and pterygopalatine fossae.

3rd part of maxillary a. and **extention (the deepest part) of the pterygoid venous plexus.**



Communication

Inferior orbital fissure: ventrocranial part of fossa to the orbit. Zygomatic nerve, infraorbital nerve and vessels, inferior ophtalmica vein and . orbitalis muscle.



It has a pyramidal shape – base located upward and apex downward. Communication:



Communication



Contents

End part – 3ed part -(pterygopalatine part) of maxillary artery and branches:

- 1. Infraorbital a.
- 2. Sphenopalatine a.
- 3. Posterior superior alveolar a.
- 4. Artery of pterygoid canal
- 5. Descending palatine a.

Extention of the *plexus pterygoideus*

Ganglion pterygopalatinum.

N. maxillaris and the branches n. infraorbitalis, n. zygomaticus a nn. pterygopalatini.



Table 6.10 Branches of the maxillary artery within the pterygopalatine fossa

Part of maxillary artery	Artery		Distribution
Pterygopalatine part	① Infraorbital a.		Cheek, upper lip, nose, lower eyelid
		Anterior and middle superior alveolar aa.	Maxillary anterior teeth (to premolars), maxillary sinus
	② Sphenopalatine a.	Lateral posterior nasal aa.	Lateral wall of nasal cavity, choanae, paranasal sinuses (frontal, maxillary, ethmoidal, and sphenoidal)
		Posterior septal branches	Nasal septum and conchae
	③ Posterior superior alveolar a.		Maxillary premolars, molars, gingiva, maxillary sinus
	④ A. of pterygoid canal		Pharyngotympanic (auditory) tube, tympanic cavity, upper pharynx
	⑤ Descending palatine a.	Greater palatine a.	Hard palate, nasal cavity (inferior meatus), maxillary gingiva
		Lesser palatine a.	Soft palate, palatine tonsil, pharyngeal wall



Contents

End part – 3ed part - (pterygopalatine part) of *a. maxilaris* and branches:

- 1. Infraorbital a.
- 2. Sphenopalatine a.
- 3. Posterior superior alveolar a.
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- 5. Descending palatine a.

Extention of the plexus pterygoideus

Ganglion pterygopalatinum

N. maxillaris and the branches:

- 1. Infraorbital nerve
- 2. Zygomatic nerve
- 3. pterygopalatine nerves (ganglionic branches):
- 8. Posterior superior nasal nn. Divided to lateral and septal (medial) brr.(passes through the sphenopalatine foramen)
- 8. Posterior inferior nasal nn.
- Nasopalatine nerve (runs through incisive canal and foramen) for innervation of anterior part of the hard palate
- 6. Greater palatine nerve for innervation of posterior part of the hard palate
- **7.** Lesser palatine nerves for innervation of the soft palate
- Pharyngeal branches for nasopharynx and isthmus faucium
- Tonsillar branches for palatine tonsil



Table 6.11 Nerves that emerge from pterygopalatine fossa*

Transmitted nerves	Distribution		
① Infraorbital n.	Sensory to lower eyelid, maxillary sinus, and upper incisors, canines, and premolars.		
② Zygomatic n.	Sensory to skin of the temple (zygomaticotemporal n.) and cheek (zygomaticofacial n.)		
3 Orbital branches (from CN V ₂)	Sensory to orbital periosteum, sphenoid sinus, and ethmoidal air cells		
④ Maxillary n. (CN V ₂)	Gives off only sensory branches within pterygopalatine fossa		
⑤ N. of pterygoid canal (Vidian n.)	 Greater petrosal n. carries preganglionic parasympathetic fibers to the pterygopalatine ganglion (from CN VII); Deep petrosal n. carries postganglionic sympathetic fibers to the pterygopalatine ganglion 		
6 Greater palatine n.	Sensory to gingiva, mucosa, and glands of the posterior two thirds of the hard palate		
⑦ Lesser palatine nn.	Sensory to soft palate, palatine tonsils, and uvula		
⑧ Medial and lateral posterior superior and posterior inferior nasal branches (from nasopalatine n., CN V ₂)	Sensory to the posterosuperior nasal cavity; medial branches also sensory to posterior nasal roof and septum; lateral branches also sensory to posterior ethmoid air cells and mucosa overlying the superior and middle nasal conchae		

*Because the pterygopalatine fossa contains all branches of CN V_2 , it is the site of needle placement for a maxillary division block.



Content

End part – 3ed part - (pterygopalatine part) of *a. maxilaris* and branches:

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- 5. Descending palatine a.

Extention of the *plexus pterygoideus*

Ganglion pterygopalatinum

- N. maxillaris and the branches:
- 1. Infraorbital nerve
- 2. Zygomatic nerve
- 3. pterygopalatine nerves (ganglionic branches):
- 8. Posterior superior nasal nn. Divided to lateral and septal (medial) brr.(passes through the sphenopalatine foramen)
- 8. Posterior inferior nasal nn.
- Nasopalatine nerve (runs through incisive canal and foramen) for innervation of anterior part of the hard palate
- **6.** Greater palatine nerve for innervation of posterior part of the hard palate
- 7. Lesser palatine nerves for innervation of the soft palate
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- Tonsillar branches for palatine tonsil



Pterygoid plexus in infratemporal fossa



Fig. 6.28 Radiograph of pterygopalatine fossa

Coronal CT scan showing the pterygopalatine fossa (P), greater palatine canal (straight arrow), and greater palatine foramina (curved arrows).

Pterygopalatine fossa in adult without evidence of cancer. Contrast-enhanced axial CT scan shows pterygopalatine fossa (arrows) between posterior wall of maxillary sinus and anterior surface of pterygoid process of sphenoid bone. Fossa is seen as low density because of contained fat.



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Axial CT of pterygopalatine fossa



Juvenile angiofibroma of left pterygopalatine fossa in 17-year-old boy. Contrast-enhanced CT image reveals intensely enhanced mass centered in left pterygopalatine fossa (star). Mass extends laterally into masticator space (arrowhead) via pterygomaxillary fissure. Right pterygopalatine fossa (arrow) is normal.





Inverting papilloma - computed tomography

<u>Transverse</u> section through the nasal cavity. A spindle-shaped tumor fills in the nasal cavity. The tumor extends into the pterygopalatine fossa (arrow) and the posterior and medial wall of the maxillary <u>sinus</u> is destroyed being suspicious for a malignant component within the <u>polypoid</u> tumor.



Clinical picture of the patient showing entry wound after suturing. foreign body had penetrated the posterior wall of the left maxillary sinus and was partially lying in the pterygopalatine fossa





Parapharyngeal(lateral pharyngeal) and retropharyngeal spaces

Omid Moztarzadeh

It is the most medial space in the infratemporal region on the lateral surface of the pharynx. It contains soft cannective tissue, blood vessels and nerves.



The parapharyngeal space is shaped like an inverted pyramid, with the skull base superiorly, and the greater cornu of the hyoid bone the apex, inferiorly.



The parapharyngeal space (or lateral pharyngeal space) is a potential space in the head and the neck. It has clinical importance in otolaryngology due to parapharyngeal space tumours and parapharyngeal abscess developing in this area.



The superior aspect is the base of skull, namely the sphenoid, temporal and occipital bones. It includes in this area the jugular foramen and hypoglossal foramen and the foramen lacerum (through which the internal carotid artery passes superiorly across).

The medial aspect is made up of the pharygeal wall and pharyngobasilar fascia.

Anteriorly it is bordered by the pterygomandibular raphe, and medial pterygoid muscle fascia.

Posteriorly it is bordered by prevertebral fascia and muscles (longus colli and capitis), scaleni mm., sternocleidomastoid m.

The lateral aspect is more involved, and is bordered by the ramus of the mandible, the deep lobe (retromandibular portion) of the parotid gland, the medial pterygoid muscle, and below the level of the mandible, the lateral aspect is bordered by the fascia of the posterior belly of digastric muscle.

Inferiorly – junction of post. Belly of digastric and the hyoid bone



Transverse section of the head at the level of rima oris (C2/C3)

- **1. Fscial artery and vein 2. Openning of the parotid duct**
- 3. Pterygomandibular raphe 4. Palatine tonsile
- 5. Ascending palatine artery 6. Ascending pharyngeal artery
- 7. Superior constrictor muscle of pharynx 8. Retropharyngeal space
- 9. Longus coli muscle 10. Internal carotid artery
- **11. Sympathetic trunk enclosed in prevertebral fascia 12. Vagus nerve**
- **13. Glossopharyngeal nerve 14. Hypoglossal nerve**
- **15. Internal jugular vein 16. Accessory nerve**
- **17. Sternocleideomastoid muscle 18. Posterior belly of digastric muscle**
- **19. Stylohyoid muscle 20. Styloid process**
- 21. Parotid gland 22. External carotid artery
- 23. Styloglossus muscle 24. Stylopharyngeus muscle
- 25. Inferior alveolar nerve and artery 26. Medial pterygoid muscle
- 27. Lingual nerve 28. Masseter muscle 29. Mandible


Styloid septum

Is a fibromuscular septum, formed by the m.stylopharyngeus, m. styloglossus, m.+ lig. stylohyoideus and posterior belly of digastric m., with their fascia. Septum medially connected to the wall of the pharynx and laterally to the medial surface of the sternocleidomastoid m.



Styloid septum

The styloid septum divides the parapharyngeal space into the anterior part - praestyloid space and posterior part - retrostyloid space.

External carotid a.: runs 10 to 15 mm from lower part of the palatine tonsil between m.styloglossus and m. stylohyoideus. A.palatina ascendens: runs between m. stylopharyngeus a m. styloglossus.



Praestyloid and retrostyloid spaces

Praestyloid space is a narrow space between upper part of the pharynx about the level of the superior constrictor muscle, medial surface of the medial pterygoid muscle and muscles of the styloid septum. Caudally it become wider as a paratonsilar space – spread of infection (tosillitis) and bleeding (tonsillectomy)!!.

The praestyloid space communicates to the submandibular region through the fissure between m. styloglossus a m. stylohyoideus – spread of the infection from palatine tonsil to the submandibular Region.

Retrostyloid space is a narrow space between pharyngeal wall, prevertebral layer of the cervical fascia and the styloid septum.Caudally continues to the cervical paravisceral space (Carotid triangle).

These anatomical boundaries make it continuous with the retropharyngeal space. It also communicates with other cervical and cranial fascial spaces, as well as the mediastinum.

At the level of inferior margin of mandible or C6 under sytloid septum prae and retro styloid spaces joine and communicate with carotis triangle.



carotid sheath. It terminates at the T1 vertebral level, superior to the sternoclavicular joint, by uniting with the subclavian vein to form the brachiocephalic vein. A large valve near its termination prevents reflux of blood into the vein.



Right lateral view

gure 8.18. Relationships of nerves and vessels to suprahyoid muscles of anterior cervical region. The positive of the digastric muscle, running from the mastoid process to the hyoid, holds a superficial and key position in the ner ssels and nerves cross deep to this belly except for cervical branches of the facial nerve (CN VII), facial branches of the ricular nerve, and the EJV and its connections, none of which is shown here.

The superior, anterior, lateral, posterolateral and posterior boundaries are somewhat rigidly bounded by bone or thick fascia, therefore masses arising within the parapharyngeal space tend to enlarge medially and inferiorly



Figure showing parotid tumor growing inwards and pushes the parapharyngeal space anteromedially. It usually displaces the tonsil / lateral pharyngeal wall medially.





Tumors of the parapharyngeal space (PPS) are uncommon, comprising less than 1% of all head and neck neoplasms. Both benign and malignant tumors may arise from any of the structures contained within the parapharyngeal space (PPS). Of parapharyngeal space (PPS) tumors, 70-80% are benign, and 20-30% are malignant. Most parapharyngeal space (PPS) tumors are of salivary or neurogenic origin, although metastatic lesions; lymphoreticular lesions; and a variety of uncommon, miscellaneous lesions may arise in this location.



Illustration showing tumor involving the pharyngeal mucosal space displacing the parapharyngeal space pad of fat inferiorly. This displacement can be clearly seen inCT / MRI imaging.



Second branchial cleft cyst in 35-year-old woman with multiple lower cranial palsies that subsided after removal of lesion. Axial enhanced T1-weighted spin-echo MR image shows well-marginated, nonenhancing mass that is slightly hyperintense to cerebrospinal fluid in right prestyloid parapharyngeal space, displacing internal carotid artery and internal jugular vein to its posterolateral side (*arrow*).



Basal cell adenoma in 61-year-old woman with bulging mass on left oral cavity. Axial unenhanced T1-weighted spin-echo MR image shows round, solid and cystic (peripheral high-signal-intensity) (*asterisk*) mass in left prestyloid parapharyngeal space. Cystic contents were hemorrhagic on aspiration. Linear fat line between tumor and parotid gland (*arrow*) suggests extraparotid origin of tumor.



Resection pleomorphic adenoma of parapharyngeal space (deep lobe parotid).



Cross-section of the pterygomandibular space showing various anatomical structures that could be affected by a misplaced injection. In particular, note the presence of the parotid gland, with the embedded facial nerve.

Borders of pterygomandibular space:

- Space between lateral surface of the mdial pterygoid m. and medial surface of the ramus of the mandible
- **Dorsally** is close to the retromandibular part of the parotid gland
- **Cranially** partly bordered by lateral pterygoid m.
- Anteriorly by pterygomandibular raphe
- The pterygomandibular space contains the inferior alveolar neurovascular bundle, lingual nerve, Lig. Sphenomandibulare, and part of the buccal fat pad, chorda tympani.



Content



Transverse section of the mandibular ramus at the level just superior to the lingula. (R: Ramus, IAN: inferior alveolar nerve, IAV: inferior alveolar vein, IAA: inferior alveolar artery, SML: sphenomandibular ligament, MP: medial pterygoid muscle, B: buccinator, PMR: pterygomandibular raphe, SCM: superior constrictor muscle, TT: tendon of temporalis L: lingula). The needle is shown passing through the pterygomandibular space where it is directed to an area of bone just superior to the lingula, L. This is the level at which an IANB should be administered.



Anterior

Pterygomandibular space



Branches of V3: Nerves supplying the muscles of mastication – ant. + post. temporal nn, masseteric n., nerve to lateral and medial pterygoid mm plus two tensor muscles: 1) tensor veli palatini and 2) tensor tympani.

Meningeal n, auriculotemporal n, inferior alveolar n. (between lateral and madial pterygoid mm), lingual n., buccal n.(runs on anterior margin of the tendon of the temporal m. down and forward and continue on the external surface of the buccinator m).



The buccal nerve passes laterally between the upper and lower heads of the lateral pterygoid and then descends around the anterior margin of the insertion of the temporalis muscle to the anterior margin of the ramus of the mandible, often slipping through the tendon of the temporalis. It continues into the cheek lateral to the buccinator muscle to supply general sensory nerves to the adjacent skin and oral mucosa and the buccal gingivae of the lower molars. The lingual nerve first descends between the tensor veli palatini muscle and the lateral pterygoid muscle, where it is joined by the chorda tympani nerve, and then descends across the lateral surface of the medial pterygoid muscle to enter the oral cavity.



В







Inferior alveolar nerve block and mental nerve block

La critargo cabro









С



properly extracted. A few months later he visited an oral and maxillofacial surgeon in the U.K. He complained of pain and reduced ability to open his mouth. A CT scan that was performed showed a tooth and tooth fragment present between his tonsillar soft tissue and medial pterygoid space. The wisdom tooth and tooth fragment were sucessfully retrieved under general anesthesia



Panorex using 2 localizing needles shows broken needle (red arrow)



Computed tomography scan (axial cut) with part of a needle visualized in the right pterygomandibular space (yellow arrow).



Diagrammatic <u>illustration</u> showing the spread of a dentoalveolar abscess into contiguous fascial spaces. (1 Submandibular abscess, 2 pterygomandibular abscess, 3 parapharyngeal abscess, 4 retropharyngeal abscess)



Incision for drainage of a pterygomandibular abscess



Parapharyngeal spaceposterior view

The common and internal carotid arteries travel with the internal jugular vein and vagus nerve within the carotid sheath, which attaches to the skull base.





Deep cervical fascia

1 Superficial layer of deep cervical fascia (yellow) = Deep cervical fascia + Superficial nuchal fascia.

2 Prevertebral layer of deep cervical fascia (purple) = Prevertebral fascia + Deep nuchal fascia.

3 Pretracheal layer Muscular portion (light green).

(4) Pretracheal layer Visceral portion (dark green): Attaches to the cricoid cartilage and is continuous posteriorly with the buccopharyngeal fascia. Continues inferiorly into the superior mediastinum, eventually merging with the fibrous pericardium.



Despite generally being continuous, many of the fascial layers bear different names in different regions of the neck relative to the structures they enclose.

Fascial layer	Description	Contents
Superficial cervical fascia (not shown)	Subcutaneous tissue that lies deep to the skin and contains the platysma anterolaterally.	Platysma
① Superficial layer of deep cervical fascia (yellow) = Deep cervical fascia + Superficial nuchal fascia	Envelops the entire neck and is continuous with the nuchal ligament posteriorly.	Splits around the trapezius and sternocleidomastoid
 Prevertebral layer of deep cervical fascia (purple) Prevertebral fascia + Deep nuchal fascia 	Attaches superiorly to the skull base and continues inferiorly into the superior mediastinum, merging with the anterior longitudinal ligament. Continues along the subclavian artery and brachial plexus, becoming continuous with the axillary sheath. •The prevertebral fascia splits into an anterior (alar) and a posterior layer (the "danger space" is located between these layers).	Intrinsic back muscles and prevertebral muscles
Pretracheal fascia (green)	③ Muscular portion (light green)	Infrahyoid muscles
	(4) Visceral portion (dark green): Attaches to the cricoid cartilage and is continuous posteriorly with the buccopharyngeal fascia. Continues inferiorly into the superior mediastinum, eventually merging with the fibrous pericardium.	Thyroid gland, trachea, esophagus, and pharynx
Carotid sheath (blue). Derived from deep, prevertebral, and pretracheal layers.	Consisting of loose areolar tissue, the sheath extends from the base of the skull (from the external opening of the carotid canal) to the aortic arch.	Common and internal carotid arteries, internal jugular vein, and vagus nerve (CN X); in addition, CN IX, CN XI, and CN XII briefly pass through the most superior part of the carotid sheath.

Retropharyngeal space lies between the **anterior alar layer of the prevertebral fascia** and **the posterior Portion of the pretracheal fascia the buccopharyngeal fascia**



The retropharyngeal space extends **superiorly to the base of the skull** and **inferiorly to the posterior mediastinum** at the level of the tracheal bifurcation. In normal circumstances, the retropharyngeal space is a virtual space and contains the **retropharyngeal lymph nodes superiorly (at the level of C2), branches of ascending pharyngeal a+v as well as some fatty tissue.** Infections of the mouth can spread through this space into the posterior mediastinum.There are two other spaces in close proximity to the retropharyngeal space: the **1. danger space** and the **2. prevertebral space.** They are often confused with the retropharyngeal space.



The alar fascia is a layer of fascia, sometimes described as anterior part of the prevertebral fascia, and sometimes as in front of it. Cranially, it reaches the skull, and caudally, it reaches the second thoracic vertebra. It is the posterior border of the retropharyngeal space.

The danger space actually lies between the alar fascia, which forms the posterior border of the retropharyngeal space, and the prevertebral fascia. It extends from the cranial base above to the level of the diaphragm.

The prevertebral space is bounded anteriorly by the prevertebral fascia and posteriorly by the longus colli muscles of the spine. It extends down the mediastinum and continues to the insertion of the psoas muscles.




Normal anatomy of retropharyngeal space. Diagram of fascial layers of retropharyngeal space (*double-headed arrow*). True retropharyngeal space is between visceral fascia and alar fascia of deep layer of deep cervical fascia. Danger space is between alar and prevertebral layers of deep cervical fascia. These two components cannot be distinguished on MRI and CT in healthy patient.



Retropharyngeal space (green) lies between the anterior (alar) layer of the prevertebral fascia (red) and the buccopharyngeal fascia, the posterior portion of the pretracheal fascia. The parapharyngeal space is divided by the stylopharyngeal aponeurosis into an anterior and a posterior part. The anterior part (yellow) is contained within the pretracheal fas cia in the neck (this section is through the oral cavity). The posterior part (orange) is contained within the carotid sheath.



Transverse section, superior view. The pharynx, larynx, and thyroid gland are enclosed by the pretracheal fascia. The posterior portion of the pretracheal fascia that is in direct contact with the pharynx is called the buccopharyngeal fascia. The fascial space surrounding the pharynx (peripharyngeal space) is divided into a posterior (retropharyngeal) space and a lateral (parapharyngeal) space.



Bacteria and inflammatory processes from the oral and nasal cavities (e.g., tonsillitis, dental infections) may invade the peripharyngeal space. From there, they may spread in various directions (A). Invasion of the internal jugular vein may lead to bacteremia and sepsis. Invasion of the subarachnoid space poses a risk of meningitis.



Spread of infection

Inflammatory processes may also track downward into the mediastinum – (gravition abscess, causing mediastinitis).

(1) These may spread anteriorly in the spaces between the superficial layer of the deep cervical fascia and muscular pretracheal fascia – suprasternal interfascial space or

(2) in the space within the pretracheal fascia.

(3) They may also spread posteriorly in the retropharyngeal space between the buccopharyngeal anterior fascia and the (alar) layer of the prevertebral fascia.

(4) Infections that enter the "danger space" between the anterior and posterior layers of the prevertebral fascia may spread directly into the mediastinum.



An axial contrast enhanced CT-image of an infant with fever. The child cannot swallow. This pathology is located in the retropharyngeal space.

The prevertebral muscles are pushed towards the vertebral body. If this were a lesion located in the perivertebral space, these muscles would be pushed anteriorly.

The retropharyngeal space is expanded and contains multiple pockets of material with fluid density. Obviously this is a retropharyngeal infection with multiple abscesses.

This is an emergency situation because the abscesses will expand and may eventually obstruct the airways.

Usually these deep abscesses require surgical drainage.



