Infection of the fascial spaces

Infection of spaces in relation to the lower jaw

1. Submental space infection

Anatomic boundaries this space lies between the **Mylohyoid muscle above**, **skin, subcutaneous tissue, Platysma muscle and deep cervical fascia below,** laterally by **lower border of the mandible and anterior bellies of Digastric muscle.**

It contains submental lymph nodes embedded in adipose tissues.

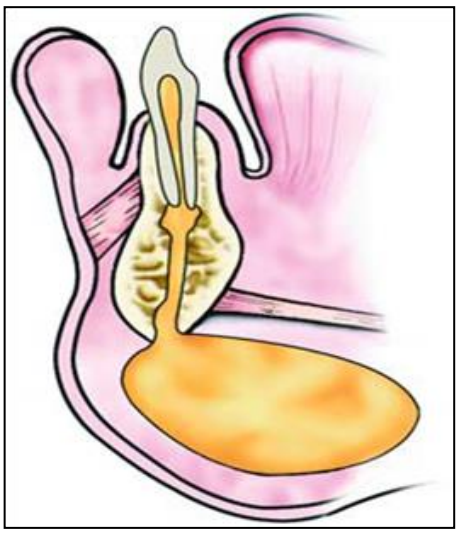
Source of infection a direct source is from infected lower incisors and canines, lower lip, skin overlying the chin or from the tip of the tongue and the anterior part of the floor of the mouth.

An indirect source of infection is from submandibular spaces.

The site of the swelling is mostly extraoral including the chin and submental areas which are firmly swollen.

The site of incision and drainage is extraoral horizontal incision through the skin posterior to the crease behind the chin, providing dependent drainage and most esthetically acceptable scar.

It may be drained intraorally through the Mentalis muscle via the labial vestibule, but the dependent drainage can not be established.



2. Submandibular space infection

Anatomic boundaries it is bounded by **Mylohyoid muscle superiorly**, **anterior and posterior bellies of Digastric muscle inferiorly**, Mylohyoid, Hyoglossus and Styloglossus muscles medially, laterally the space is bounded by the skin, superficial fascia, Platysma, deep fascia and the lower border of the mandible.

This space contains the **submandibular salivary gland and lymph nodes in** addition to facial artery and vein, lingual and Hypoglossal nerve as they course deep to the submandibular salivary gland.

Source of infection is from the lower molar teeth especially second and third molars, as the infection perforates the lingual cortex of the mandible below the Mylohyoid muscle attachment.

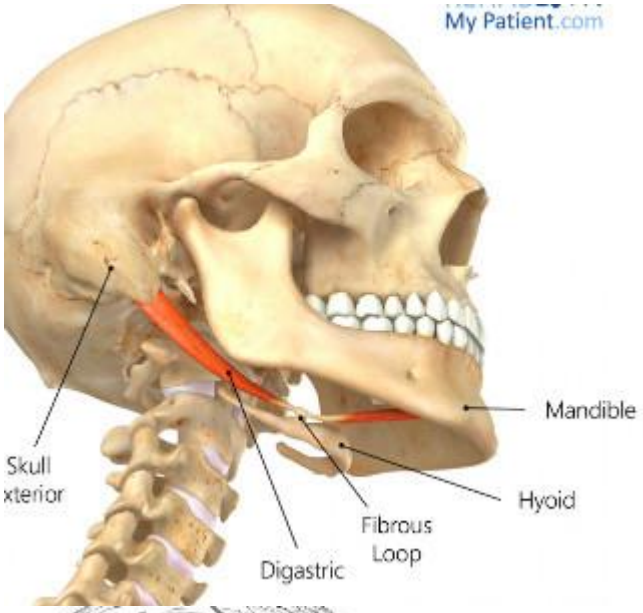
Infection can also spread from the tongue, posterior part of the floor of the mouth, upper posterior teeth, cheek, palate, the maxillary sinus and the submandibular salivary gland.

Indirectly the infection may spread from infected sublingual and submental spaces.

Submandibular space infections can spread posteriorly to the pharyngeal space.

Submandibular space infection presents as a firm or fluctuant **erythematous swelling of the submandibular region**, the swelling bulges **over and obliterates the inferior border of the mandible**, there may be trismus, other signs and symptoms of infection may or may not be present.

Site of incision and drainage it is extraoral incision made parallel and about 2 cm. below the inferior border of the mandible to avoid injury to the marginal mandibular branch of the facial nerve, the incision extends through the skin and subcutaneous tissue only while the space is entered bluntly to avoid structures within the space.


My Patient.com
Skull
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Loop
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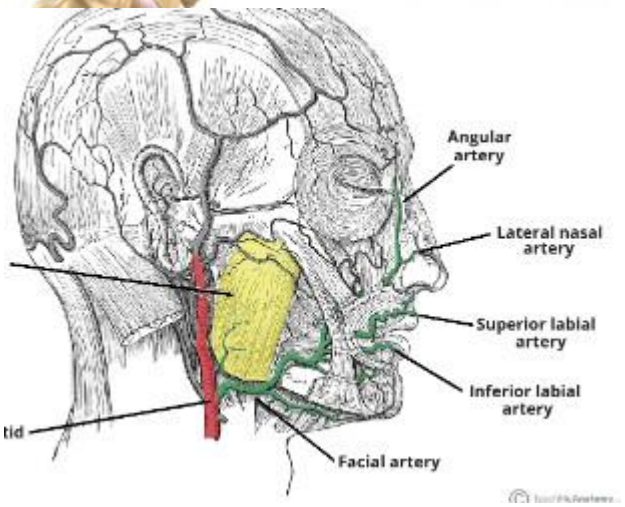
Angular
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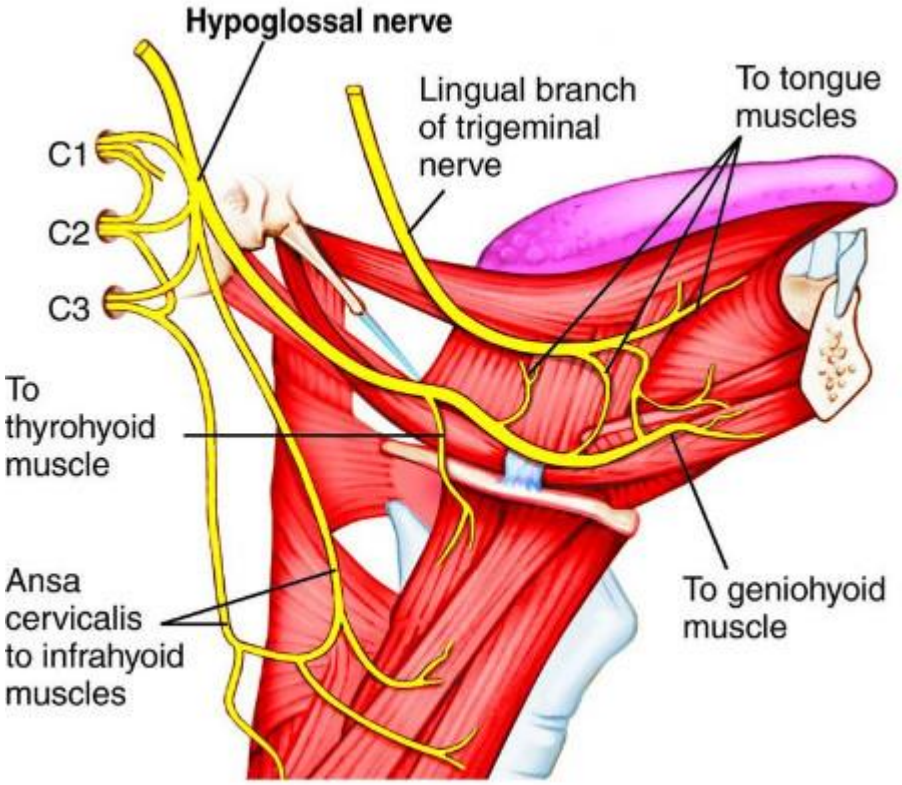
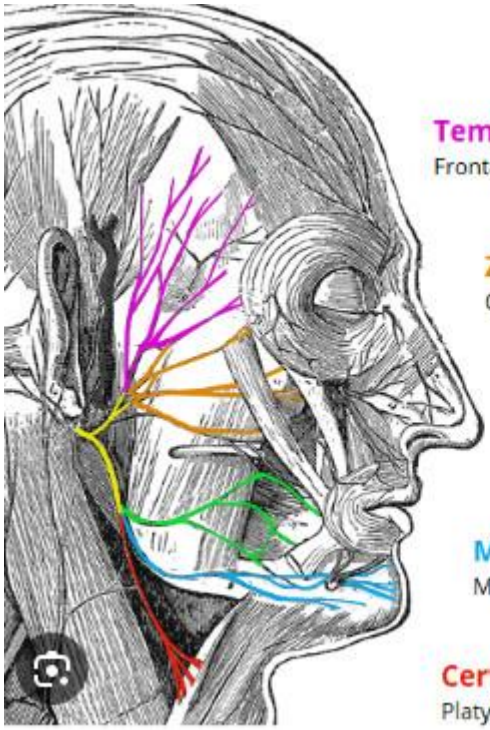




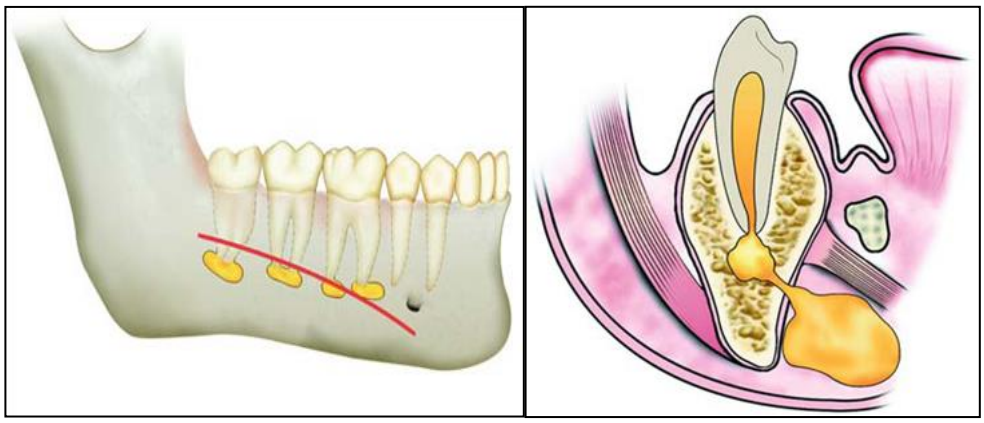
Temporal branches
Frontalis, orbicularis oculi, corrugator supercilii

Zygomatic branches
Orbicularis oculi

Buccal branches
Orbicularis oris, buccinator, zygomaticus

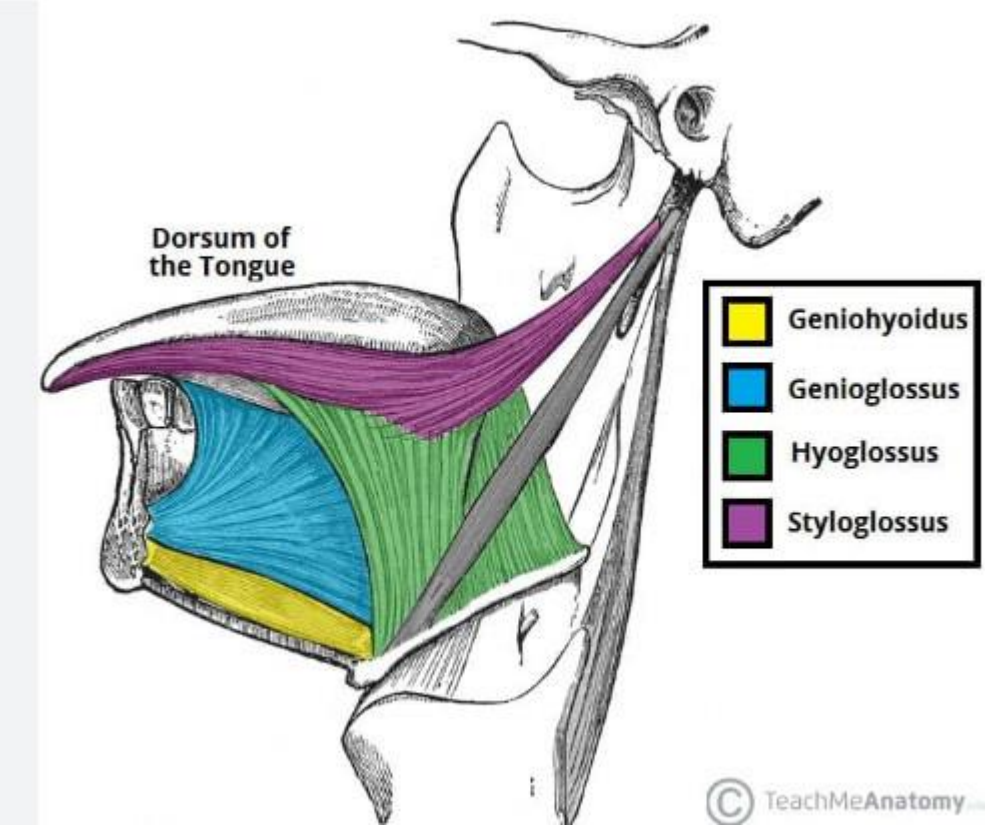
Marginal mandibular branches
Mentalis, depressor labii inferioris, depressor anguli oris

Cervical branches
Platysma



3. Sublingual space infection

Anatomic boundaries this is a V-shaped space, it is bounded anteriorly and laterally by the mandible, superiorly by sublingual mucosa, inferiorly by the Mylohyoid muscle and medially by Genioglossus, Geniohyoid and Styloglossus muscles.



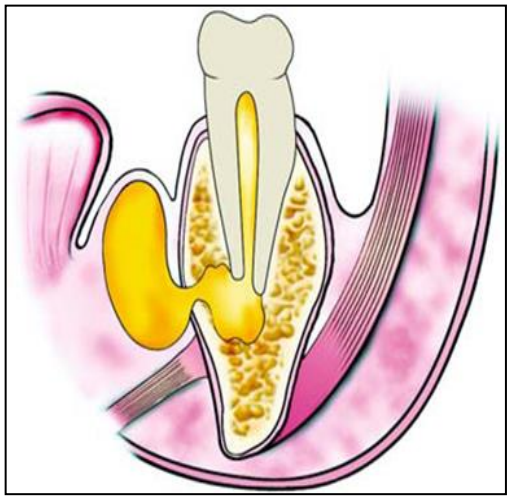
Source of infection it is usually from the premolar and less commonly from molar teeth when the infection perforates the lingual cortex of the mandible above the **attachment of the Mylohyoid muscle.**

Indirectly the infection may spread from submental and submandibular spaces. Infection from sublingual space may invade the submandibular and pharyngeal spaces.

Clinically there is erythematous swelling of the floor of the mouth that may extend through the midline since the barrier between the two sublingual spaces is weak, usually there is elevation of the tongue.

Site of incision and drainage intraorally by an incision through the mucosa only parallel to Wharton's duct and lingual cortex in anteroposterior direction and away from the sublingual fold.

This space may be drained extraorally through submandibular and submental incisions through the Mylohyoid muscle if the infection of these latter spaces is also evident.



Ludwig's Angina

It is a massive firm cellulitis, affecting simultaneously the submandibular, submental and sublingual spaces bilaterally. It is a very serious condition that requires prompt treatment, it was described by Wilhelm Friedrich von Ludwig in 1836.

Causes

- Dental infections in 90% of the cases.
- Submandibular salivary gland infections.
- Mandibular fractures.
- Soft tissue lacerations and wounds of the floor of the mouth.

The term angina is related to the sensation of suffocation.

If untreated this condition is almost fatal mainly due to posterior extension of the infection into the epiglottis causing epiglotic edema and respiratory obstruction.

Signs and Symptoms:

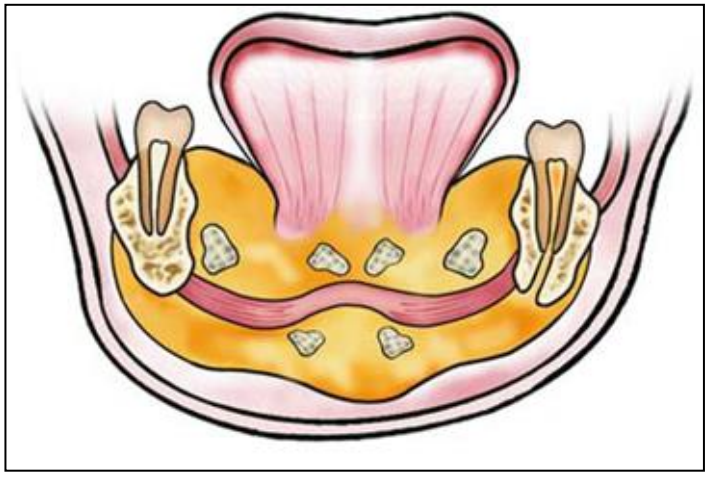
There is a firm extensive bilateral submandibular swelling, intraorally there is swelling of the floor of the mouth that raises the tongue which may protrude from the mouth in extreme cases.

The patient is toxic, **feverish** and there is **dyspnea and difficulty in swallowing.**

Treatment

- Securing the airway, endotracheal intubation is very difficult in this situation, **tracheostomy may be needed**, but it is also difficult to perform due to the massive neck edema.
- **General anesthesia should be avoided.**
- **Early surgical drainage of all the infected spaces bilaterally under local anesthesia, little pus is obtained since the infection is usually cellulitis**.
- Intravenous antibiotic, using a combination of Penicillin and Metronidazole.

Some disciplines advocate high dose of antibiotics without surgery until fluctuation develops.



4. Buccal space infection

Anatomic boundaries bounded by the Buccinator muscle and buccopharyngeal fascia medially, skin of the cheek laterally, labial musculature anteriorly, zygomatic arch superiorly, the inferior border of the mandible inferiorly and the pterygomandibular raphe posteriorly.

It contains **the buccal pad of fat**, **facial artery and the parotid duct**.

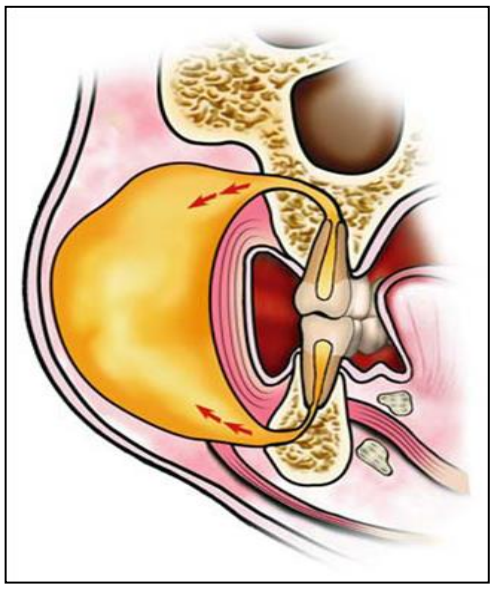
Source of infection of this space can be related to both jaws.

The relationship of the origin of the Buccinator muscle from the alveolar bone and the apecies of the upper and lower premolars and molars determines the direction of the spread of infection from these teeth. If the infection exits the alveolar bone above the attachment of the muscle in the upper alveolus or below the attachment in the lower alveolus, the infection spreads to the buccal space. Otherwise the infection spreads intraorally into the vestibule where it can be drained easily.

Usually the swelling appears in the cheek, the inferior border of the **mandible can still be palpated.**

Site of incision and drainage intraorally by a horizontal incision in the buccal mucosa below the parotid duct, the incision should be through the mucosa only, the space should be entered bluntly using an artery or sinus forceps through the Buccinator muscle to avoid damage to the **facial artery and nerve.**

The incision can be placed extraorally if the pus points cutaneously.



5. Masticator spaces infection

These are well differentiated spaces but they communicate with each other as well as with the buccal, submandibular and pharyngeal spaces. They are:

- Masseteric space.
- Pterygomandibular space.
- Temporal space.

Masseteric space infection (also called submasseteric space)

Anatomic boundaries this space lies between the outer surface of the ascending ramus of the mandible medially, the Masseter muscle laterally and the parotid gland posteriorly.

Source of infection usually from molar teeth especially **lower third molars**, it can also occur after **fracture of the angle of the mandible** or it can also spread from **buccal space**.

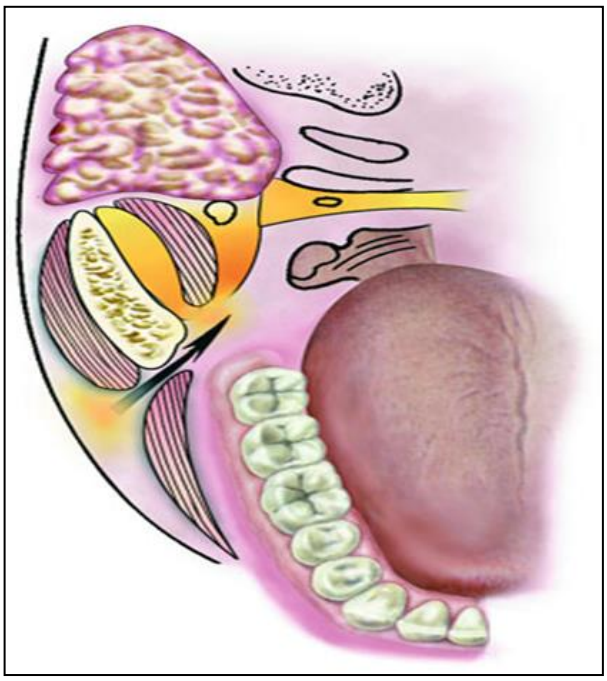
The swelling is moderate in size over the ascending ramus and the angle of the mandible region. This infection is characterized by a **marked trismus**.

Chronic abscess can run a protracted course and can spread to the muscle itself or it can cause osteomyelitis of the ramus of the mandible.

Site of incision and drainage extraorally below and behind the angle of the mandible, the incision is carried through the skin and the subcutaneous tissue then by blunt dissection through the Platysma muscle and the deep fascia, after incising the attachment of the muscle at the angle the periosteal elevator is inserted beneath the muscle and in close contact with the outer surface of the ramus of the mandible to drain all the pus.
Intraorally drainage can be carried out through an incision along the **anterior border of the ramus of the mandible**, but in this case the drainage can be insufficient as it is not in a dependent point, also intraoral drainage may prove to be very difficult due to the presence of trismus.

Pterygomandibular space infection

Anatomic boundaries it is bounded medially by the Medial Pterygoid muscle, laterally by the medial surface of the ramus of the mandible, Lateral Pterygoid muscle superiorly, parotid gland posteriorly and the pterygomandibular raphe and the Superior Constrictor muscle of the pharynx anteriorly.
Source of infection usually from molar teeth especially lower third molars, it can also result after inferior dental nerve block with contaminated needle or solution.
Infection can spread from submandibular, sublingual and infratemporal spaces.
Swelling is minimal near the angle of the mandible or sometimes there is no swelling at all, but there is a marked **trismus.**
Site of incision and drainage extraorally, the same as that described in the masseteric space infections but directed to the inner surface of the ramus.
Intraorally can be drained through an incision made just **medial** to the pterygomandibular raphe and dissecting along the inner surface of the ramus., but the presence of trismus can prevent efficient drainage.



Temporal space infection

Anatomic boundaries the Temporalis muscle divides this space into two spaces:

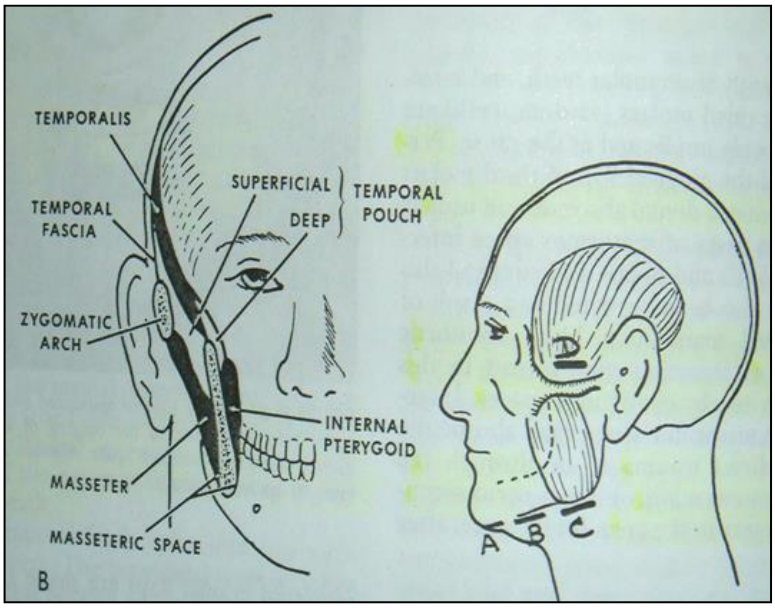
- Superficial temporal space; between the muscle and temporal fascia.
- Deep temporal space; between the muscle and the temporal bone.

The temporal space is contiguous with the pterygomandibular and masseteric spaces.

Source of infection upper and lower molars, or by extension from the other masticator spaces.

The swelling is behind the lateral orbital rim and above the zygomatic arch, it is almost always associated with trismus.

Site of incision and drainage extraoral, through an incision superior and parallel to the zygomatic arch between the **lateral orbital rim and the hair line.** Intraorally this space can also be drained through an incision along the anterior border of the ascending ramus with the artery forceps directed upwards on the outer aspect of the ramus, but the presence of trismus makes this approach difficult.



6. Lateral pharyngeal space infection (also termed parapharyngeal space)
Anatomic boundaries this space extends from the base of skull to the hyoid bone, it is conical in shape, the lateral boundaries include the medial surface of the **Medial Pterygoid muscle**, the **medial wall is the Superior Constrictor muscle, Styloglossus** muscle**, Stylopharyngeus** muscle and **the Middle Constrictor muscle of the pharynx**. Posteriorly by the parotid gland and anterirorly by pterygomandibular raphe.
This space can be divided into two compartments; anterior and posterior, the latter contains the carotid sheath.
Source of infection spread of infection from upper and lower molar teeth, most commonly from lower third molar infections by the way of submandibular, sublingual and pterygomandibular spaces.
A non-odontogenic infection can spread to this space like tonsillar infections.
Infections of this space are serious, the patient exhibits pain, fever, chills, medial bulge of the lateral pharyngeal wall, extraoral swelling below the angle of the mandible and trismus. It may lead to respiratory obstruction, **septic thrombosis of the internal jugular vein and carotid artery hemorrhage**.

Site of incision and drainage intraoral incision medial to the pterygomandibular raphe with the dissection medial to the Medial Pterygoid muscle.
Extraoral incision at the level of the hyoid bone anterior to the Sternocleidomastoid muscle (SCM) and the dissection continued superiorly and medially between the submandibular gland and the posterior belly of Digastric muscle.
Through and through drainage can also be applied.

7. Retropharyngeal space infection

Anatomic boundaries extend from the base of the skull to the upper mediastinum (C6-T1), it is bounded anteriorly by posterior wall of the pharynx and posteriorly by the Alar fascia.
Source of infection upper and lower molar teeth by lateral pharyngeal space by the way of pterygomandibular, submandibular, sublingual spaces.
It can also result from nasal and pharyngeal infections.
The swelling causes bulge of the posterior pharyngeal wall, there is dysphagia, dyspnea, and fever. Lateral neck radiograph may reveal widening of the retropharyngeal space.
Site of incision and drainage extraorally by an incision anterior to the SCM below the hyoid bone, SCM and the carotid sheath are retracted laterally and blunt dissection is carried out deeply to enter the space.
Some authors advocated intraoral drainage by an incision along the posterior pharyngeal wall in extreme Trendlenburg position and suction.
Most anesthesiologists prefer tracheostomy to secure the airway.

8. Peritonsillar abscess or Quinsy

Anatomical boundaries it is localized between the C.T. bed of the faucial tonsil and the Superior Constrictor muscle of the pharynx.
Source of infection it arises from tonsillitis, but it is occasionally a complication of pericoronitis of the lower third molar.

It causes swelling of the anterior pillar of the fauces and a bulge of the soft palate of the affected side which may reach the midline and push the uvula. Also there is acute pain, dysphagia, the voice becomes muffled, odynophagia, drooling and anorexia.

Site of incision and drainage the incision is placed in the point of maximum fluctuation, this can be done under local anesthesia, if general anesthesia is used the anesthetist should be experienced and good suction be available to prevent aspiration and the patient should be in head down position.

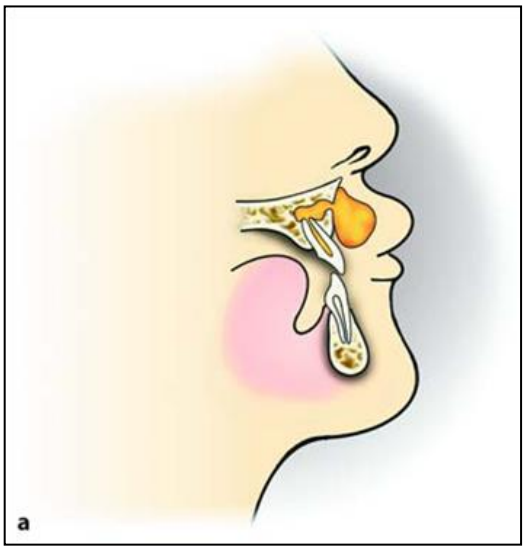
Infections of spaces in relation to the upper jaw

1. Upper lip infection

Infections of the upper incisors and canines can spread to the upper lip usually on the oral side of Orbicularis Oris muscle and points in the vestibule.

Infection of the upper lip can lead to serious complications like orbital cellulitis or cavernous sinus thrombosis by extension of infection through the superior labial vein to anterior facial vein to ophthalmic vein to cavernous sinus.

Incision for drainage is made near the vestibule intraorally.



2. Canine fossa infections

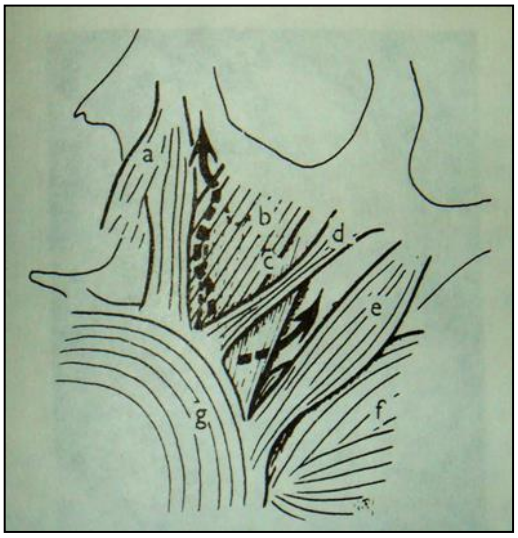
Anatomic boundaries it lies between the canine fossa and the muscles of the facial expression.

Source of infection mostly is the canine and first premolar but the infection can spread from upper incisor teeth.

Infection occurs when it spreads in the area above the origin of the Levator Anguli Oris and is directed toward the medial edge of the Levator Labii Superioris.

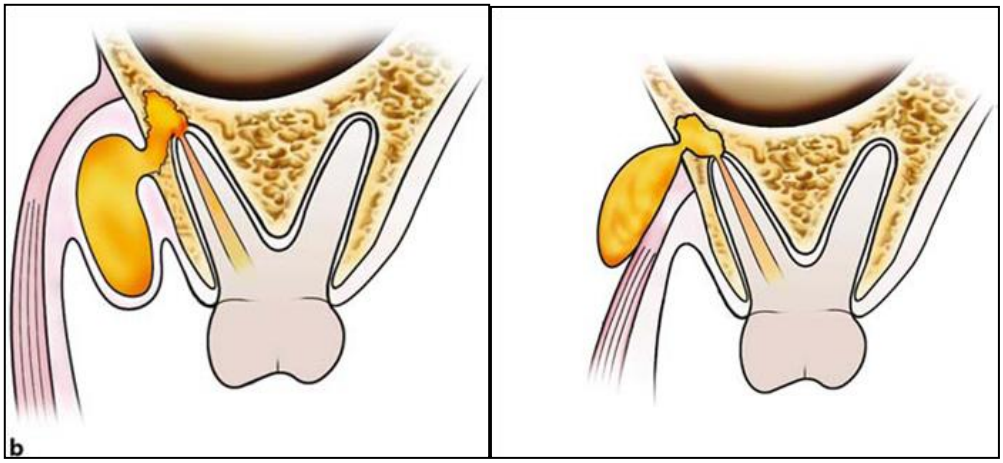
The swelling is lateral to the nose leading to obliteration of the nasolabial fold and may lead to periorbital cellulitis, there is risk of cavernous sinus thrombosis.

Site of incision and drainage intraoral horizontal incision in the buccal vestibule.



3. Buccal space infections

Infections spread from infected upper molar teeth where it spreads buccally above the attachment of Buccinator muscle. This space is already discussed.



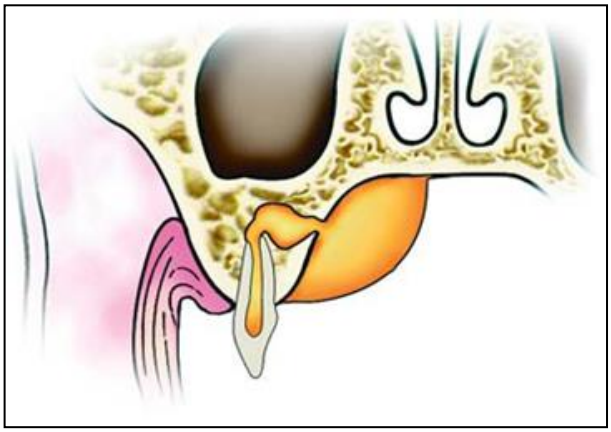
4. Subperiosteal abscess in the palate

This potential space lies between the palatal mucoperiosteum and the underlying bone, the mucoperiosteum is strongly attached in the midline and at the gingival margin, pus may accumulate beneath the mucoperiosteum leading to its separation from the underlying bone.

Source of infection it may spread from the apex of the lateral incisor which is close to the palatal bone. Also infection can spread from the palatal root of multirooted upper molars. It can also originate from palatal periodontal pocket.

The swelling causes palatal bulge between the gingival margin and the midline, confined to one side.

Site of incision and drainage anteroposterior incision parallel to greater palatine vessels.



5. Maxillary antrum

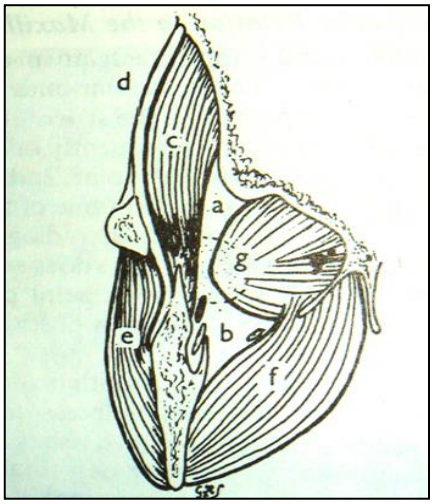
Infection from upper molars and less frequently premolars may spread to the maxillary antrum, this depends on the size of the maxillary antrum and the length of the root.
It causes acute sinusitis with facial pain that worsens on bending or leaning forward, the infection may lead a chronic course leading to mucosal thickening and polyps.
Occipitomental radiograph shows opaque maxillary sinus or fluid level.
Pus may drain partially through the sinus osteum, extraction of the causative tooth leads to drainage of pus but it may leave a defect in the floor of the sinus and cause oroantral fistula. If the defect is small and with antibiotic treatment the socket may heal uneventfully, but larger defects may require further management.

6. Infratemporal space infection

Anatomic boundaries this space is bounded laterally by the ramus of the mandible and the Temporalis muscle, medially by lateral pterygoid plate, superiorly by infratemporal surface of the greater wing of the sphenoid.
It is traversed by the maxillary artery and contains pterygoid venous plexus.
It represents the upper extremity of the pterygomandibular space.
Source of infection directly from upper molar teeth or through contaminated needle from the pterygomandibular space.
Infection may spread to the temporal space.
There could be moderate swelling in the temporal region with trismus, usually the patient is toxic with high temperature. These infections are serious since they can spread through the pterygoid venous plexus to the cavernous sinus through emissary vein or it can spread to the middle cranial fossa with headache, photophobia, irritability, vomiting and drowsiness.
Site of incision and drainage intraorally through an incision buccal to the upper third molar following the medial surface of the corronoid upward and backward, but with the presence of trismus this approach is difficult.
Extraorally through an incision in the upper and posterior edges of the

Temporalis muscle within the hair line passing downward, forward and medially.

Infection related to the maxillary teeth can spread to the masticator spaces and pharyngeal spaces and these were already discussed.



Cavernous sinus thrombosis

It is a very serious ascending infection, although not a fascial space infection but it can be caused by odontogenic infections especially of upper teeth. It can also result from upper lip, nasal and orbital infections.

Infection can spread to the cavernous sinus through two routes:

- Anterior route; through the valveless angular vein and inferior ophthalmic vein.
- Posterior route; through the pterygoid venous plexus and transverse facial vein.

This infection has a high mortality rate.

Clinical features

- Marked edema and congestion of the eyelids and conjunctiva which can be bilateral due to the spread of infection to the other side.
- Proptosis (exophthalmos) and ptosis.
- Ophthalmoplegia and dilated pupil.

- Papilloedema with multiple retinal hemorrhage.
- Fever.
- Depressed level of consciousness.

Treatment

It is an emergency that requires a neurosurgical consultation, the lines of treatment include:

- Antibiotic treatment
- Heparinization to prevent extension of thrombosis.
- Treatment of the odontogenic cause.