CLINICAL ANATOMY

Submandibular space

Boundaries of the space

Upper- lower border of mandible
Anterior- anterior belly of digastric muscle
Posterior- posterior belly of digastric muscle
Floor- mylohyoid and hyoglossal muscle
External –superficial fascia

Content

Submandibular gland with submandibular duct (Wharton duct)

1. Lingual artery
2. Facial artery (the branches of facial artery in the submandibular space are – glandular branch, mylohyoid branch, submental artery, sublingual artery)
3. Lingual vein (from one up to four)
4. Facial vein (in the lateral part of submandibular space it joins with retromandibular vein and forms common facial vein, which joins with internal jugular vein).
5. Lingual nerve
6. Hypoglossal nerve
7. marginal mandibular branch of facial nerve
8. anterior, medial and posterior groups of submandibular lymph nodes

In the submandibular space we have Lasser's (Pirogov's) triangle. The boundaries of this triangle are

- anterior – posterior lining of mylohyoid muscule
- posterior- posterior belly and tendon of digastric muscle
- upper – trunk of hypoglossal nerve
- floor - hypoglosus muscle

In the deep structures there is lingual artery.
The intermuscular fissure of submanbibular triangle is formed by mylohyoid and hypoglosus muscles.

Source of infection of submandibular space are lower premolars and molars. Secondary infection can spread into

- hypoglossal space (by intermuscular fissure of submanbibular triangle)
- submental space (anterior belly of digastric muscle)
- parapharyngeal space (by styloglossal muscule and by pterygomandibular space)
- parotid space
- anterior mediastenium (by neurovascular bundle)

Signs and symptoms

- asymmetry of the face by reason of inflammatory infiltrate
- temporary restriction of mouth opening by reason of edema and pain (trismus)
- full-blown fluctuation
- swallowing is not a disturbance
- moderate pain

Approach for incision and drainage

Incision will be minimum 5-6 cm. If it is shorter it not admits adequate revision of infection focus.
Incision will be done parallel to the lower border of mandible, 2-2,5 cm lower of it to prevent injury

of marginal mandibular branch of facial nerve and a little anteriorly from the angle of mandibule to prevent injury of facial vein. The structure which must be excised

- cutaneouse coverings
- subcutaneouse fatty tissues
- superficial fascia
- platisma muscle
- deep fascia which forms the capsule for submandibular salivary gland

Submental space

Boundaries of the space

Upper- lower border of mandible
Lower – hyoid bone
Lateral- anterior bellies of digastric muscle
Floor- mylohyoid muscle and its raphae

Content

1. anterior jugulars veins (there join with inch other and formed jugular ansa)
2. submental artery
3. mylohyoid nerve (motor branch of mandibular nerve)
4. anterior and posterior groups of submental lymph nodes

Source of infection of submental space are lower incisors and canines. Secondary infection can spread into

- submandibular space
- hypoglossal space/sublingual space.

Signs and symptoms

- asymmetry of the face by reason of inflammatory infiltrate
- there is no restriction of mouth opening (trismus)
- fluctuation can be only in the case of superficial localization
- swallowing, mastication, respiratory and speech functions are not a disturbance
- moderate pain

Approach for incision and drainage

Can be used two types of incision.
Middle, by middle sagittal line will be minimum 5-6 cm.
Transverse, incision will be done parallel to the lower border of mandible, between border of mandible and hyoid bone 3-3,5cm. This type of incision is more likely by cosmetic aspect, but it can be dangerous for satisfactory evacuation of pus. The structure which must be excised

- skin
- subcutaneous fatty tissues
- superficial fascia
- platysma muscle (if it is present)
- deep fascia

Buccal space

Boundaries of the space

Upper- lower border of zygomatic bone
Lower – lower border of mandible
Anterior- zygomaticomaxillary suture
Posterior – anterior border of masseter muscle

Content

1. buccal fat pad (Bishi`s corpus), which is located in the intermuscular fissure, between buccal and masseter muscles
2. parotid duct (Stenon's duct)
3. facial transversal artery
4. buccal branch of facial nerve
5. buccal nerve
6. facial artery, which is formed angular artery near the medial angle of orbit
7. facial vein, which is formed angular vein near the medial angle of orbit
8. superior and inferior labial arteries
9. buccal lymph nodes (not constant)

Source of infection of buccal space are lower and upper premolars and molars. Secondary infection can spread into

- infraorbital space
- parotid space
- infratemporal space

Signs and symptoms

- apparent edema of the cheek (if infection is located superficially) and moderate edema (if infection is located in the deep structures)
- restriction of mouth opening (trismus) (cause is the pain)
- moderate pain
- skin and mucosa hyperemia of buccal space

Approach for incision and drainage

Can be used two types of incision: intraoral and extraoral.
Intaoral approach should be carried out parallel to the parotid duct (upper or lower to parotid duct, commonly with contraperture formatting, because advantageously adipose buccal corpus attacks also).
Intraoral type of incision is more likely by cosmetic aspect, but in the cases of dermatogenic abscesses and cellulites, complications of furuncles and carbuncles are used extraoral approach, which is performed parallel to the branches of facial nerve or nasolabial suture

The structure which must be excised

- cutaneouse coverings
- subcutaneouse fatty tissues
- continues of superficial lamina of deep fascia, which in this space calls as buccal fascia
- buccal fat pad
- buccal muscle
- submucosa

- mucosa

Zygomatic space

Boundaries of the space

Upper - the lower border of the orbit and anterio-lower part of temporal area
Lower – anterio – superior part of buccal space
Posterior – zygomatico – temporal suture.
Anteriorly – zygomatico – maxillary suture

Source of infection.

- The Upper premolars and first molar
- Secomdary infection from buccal and infratemporal spaces

Signs and symptoms

- Edema in zygomatic area
- Hyperemia of the skin of zygomatic area
- Pain is not severe when no action
- The chewing is difficult
- Pain increases when opening the mouth

Approach for incision and drainage
The extraoral incision in zygomatic area parallel to facial nerve branches.

Infraorbital space

Boundaries of the space

Upper- lower border of orbit
Lower – alveolar process of maxilla
Medial- piriformis aperture of nose
Lateral- zygomatico-alveolar suture

Source of infection of suborbital space are upper lateral incisors, canines and premolars. Secondary infection can spread from

- buccal space
- lateral spaces of nose

Signs and symptoms

- asymmetry of the face by reason of inflammatory infiltrate in infraorbital region
- edema of upper and lower eyelids
- fluctuation
- skin hyperemia of infraorbital region

- moderate pain
- visual impairment due to edema of eyelids

Approach for incision and drainage

In case of deep localization of the process into the fossa canine incision should be done by intraoral approach on the muco-buccal fold of upper jaw in area of lateral incisor, canine and premolars.

If the process is superficial, incision must be done exraoral` parallel to the infraorbital ridge or by naso-labial fold.

Orbital space

Boundaries of the space is appropriate to the bony walls of the orbit

Contents:
Eye ball with muscles and nervus oculomotorus
Lacrimal gland, lacrimal sac

Layers:
Skin,subcutaneous tissue,muscles

Source of infection:
It can be only secondary odontogenic. Infection can penetrate from following spaces:

- *maxillary sinus,*
- *infratemporal fossa,*
- *pterygopalatal fossa,*
- *buccal space,*
- *infraorbital space,*
- *pterygomandibular space*

Signs and symptoms :

- severe edema of eyelids
- exophthalmos
- hyperemia of eyelids
- severe pain in the orbit
- headache
- visual disturbance due to severe edema of eyelids
- displacement of eyeball
- compression of ophthalmic nerve

Approach for incision and drainage:
Extra-oral incision in the external border of the orbit by upper or lower borders
Intra-oral approach can be achieved by posterior part of upper wall of maxillary sinus

Temporal space

Boundaries of the space

Upper and Posterior –superior temporal line
Lower – infratemporal crest of sphenoid bone
Anterior- zygomatic and frontal bone
Internal – temporal floor, which formed by temporal, parietal and sphenoid bones
External – zygomatic arch

Layers and content of this space

1. skin
2. subcutaneouse fatty tissues, which contains,
    - superficial temporal artery, with its two marginal branches – frontal and parietal
    - auriculotemporal nerve
    - temporal branch of facial nerve
    - magna auricular nerve(greater auricular nerve)
3. superficial fascia, which is continuation of cranial aponeurosis
4. temporal (fascia) aponeurosis, which near the zygomatic arch divides into to two laminas – superficial and deep, which are attached to the inner and outer surfaces of zygomatic arch. Between this laminas is situated intraaponeurotic cellular tissues, which contains,
    - medial temporal artery (branch of maxillar artery)
    - zygomaticotemporal nerve (branch of maxillar nerve)
5. subaponeurotic cellular tissue, which is which is continuation of temporal process of buccal fat pad
6. temporal muscule
7. deep cellular tissues, which contains,
    - profound temporal artery (branch of maxillar artery)
    - profound temporal nerve
8. periosteum
9. temporal bone

Source of infection of temporal space are secondary and can spread from

- infratemporal space
- parotid space
- buccal space (by temporal process of buccal fat pad)
- infection processes of cutaneouse coverings
- orbit(from infraorbital fissure)
- pterygopalatinefossa (by temporal process of buccal fat pad)

Signs and symptoms

- apparent edema of the temporal region (if process locates superficially) and moderate edema (if process locates in the deep structures, symptom of hourglass)

- severe restriction of mouth opening (trismus) 0.6- 0.8 cm. (due the pain) typical for deep located process
- moderate pain is typical for superficially location of process, but for deep located process typical severe pain
- skin hyperemia of temporal space is typical for superficially location of process, but not for deep localization
- disturbance of mastication due the pain
- fluctuation under the cranial aponeurosis
- not common may be secondary osteomyelitis of temporal bone

Approach for incision and drainage

In the case of superficial process is usually used cutaneouse coverings approach, parallel to the upper margin of zygomatic arch and fan-shape lances parallel to the direction of temporal muscle.
In the case of deep located process is used cutaneouse coverings approach, parallel to the anterior margin of temporal muscle, arciform lance by the line of junction of temporal muscle and bones of skull base.

Infratemporal and pterygopalatal fosses

Boundaries of the infratemporal fossa

Upper – infratemporal crest of sphenoid bone
Anterior- tuber of maxilla
Posterior – styloid process with Reolan's bundle
Internal – external lamina of pterygoid process of sphenoid bone
External – inner surface of mandible ramus

Content of the infratemporal fossa

1. maxillary artery
2. mandible nerve, with its branches
3. maxillary nerve
4. superior posterior alveolar nerves
5. pterygoid vein plexus
6. pterygoid nerve plexus
7. otic ganglion

Boundaries of the pterygopalatal fossa

Upper – maxillary surface of great wing of sphenoid bone
Anterior- infratemporal surface of maxilla and tuber of maxilla
Posterior – pterygoid process of sphenoid bone
Internal – external surface of perpendicular lamina of palatal bone

Content of the pterygopalatal fossa

1. maxillary nerve
2. infraorbital nerve
3. superior posterior alveolar nerves
4. pterygoid vein plexus

5. pterygoid nerve plexus
6. pterigopalatinal ganglion
7. sphenopalatal artery, vein and nerve

Pterygopalatal fossa has connection with orbit by infraorbital fissure, with nasal cavity by sphenopalatal foramen, cranial cavity by round foramen.

Source of infection are upper second and third molars. Very common the cause of infection can be tuberal anesthesia. Secondary infection can spread into this space from

- pterygomandibular space
- parotid space
- buccal space

Signs and symptoms

- infiltration of posterior vestibular part of oral cavity
- hyperemia of vestibular mucosa of oral cavity
- severe pain out of function, may be irradiation to the eye
- severe restriction of mouth opening (trismus) and moderate restriction of mandibule lateral motions (to the healthy side)

Approach for incision and drainage

Intraoral incision is performed in the mucobuccal fold of oral cavity upper of molars. Extraoral incision is performed by anterior margin of temporal muscle, in the subzygomatic space, if it necessary can be performed submandibular incision also, with separating of medial pterigoid muscle from mandibule ramus.

Submasseteric space

Boundaries of the space

Interior - ramus of mandibler(external surface of ramus)
Superior and exterior - interior surface of the masseter muscle
Posterior - posterior border of mandible
Anterior - anterior border of masseter muscle

Contents

- Buccal fat pad
- masseterric nerve(branch of mandibular division of trigeminal nerve)

Source of infection The most commonly source of infection are lower third molars (pericoronitis) and spread from retromolar space infection
As the result of spread from retromolar space infection and 37, 38, 47, 48 acute condition of periodontitis.

Signs and symptoms

- asymmetry of angle of the mandible by reason of inflammatory infiltrate
- intensive pain
- in the middle and inferior part of parotid space skin is hyperemic
- hyperemia and edema of mucosa of lower muco-buccal fold
- temporary restriction of mouth opening by reason of edema and pain (trismus)

Approach for incision and drainage

Incision will be on the lower muco-buccal fold from retromolar space to projection of 35, 36, 45, 46 teeth.

Comparison of infections parotid space and submasseteric space

clinical features	parotid space	submasseteral space
general condition of the patient	severe	comparative satisfactory
facial asymmetry	clinically apparent	low-grade
borders of edema	infiltration is located to the parotid space	infiltration is located to the projection of the masseter muscle
etiology of teeth	most commonly it is secondary infection	lower third molars
trismus	low-grade, when infiltration is in the deep localization	apparent
"Dissipation of edema" phenomenon	absent	present

<u>Parotid space</u>

Boundaries of the space

Superior - zygomatic arch, osteo-cartilage part of auricle
Inferior and Posterior –mastoid processes and posterior belly of digastric muscles
Anterior - anterior border of masseter muscle
Interior – lateral wall of pharynx and neurovascular bundle

Contents

1. parotid gland with parotid duct and pharyngeal process, which is not covered by capsule completely
2. lymph nodes
   - intercapsule or deeper space-the infection of this nodes are mature the Hertcenberg's pseudoparotid
   - extracapsular or superficial nodes

3. External jugular vein, go to the sternocleidomastoid muscle and join with internal jugular vein
4. Retromandibular vein
5. External carotid artery in this region gives following branches
   a) Transversal facial artery
   b) Posterior auricular artery
   c) Maxillary artery
   d) Temporal superficial artery
6. Auriculo-temporal nerve
7. Facial nerve in site of the parotid gland divides into 5 branches:
   a) Temporal
   b) Zygomatic
   c) Buccal
   d) Marginal mandibular
   e) Colli

Source of primary odontogenic infection are lower third molars.
Secondary infection can spread into

- submandibular space by stylomandibular ligament
- temporal space per continuitatem
- parapharyngeal space by pharyngeal process of parotid space, which can has fenestrations
- infratemporal fossa by semilunar of notch mandible ramus
- submasseter space
- buccal space per continuitatem

Signs and symptoms

- mark swelling of parotid space in the case of superficial location and moderate swelling of parotid space in the case of deep location
- hyperemia of the skin of parotid space
- moderate pain out of function
- masticatory function is difficult due to pain and moderate inflammatory contracture.

Approach for incision and drainage

Incision of skin surfaces must be done parallel to the branches of facial nerve.
Must performed 2 incisions:

a) by projection of zygomatic arch, 2.0-2.5sm by mandatory cutting of facia of parotid gland. Cutting layers:
   1. skin
   2. subcutaneous pad tissue
   3. fascia parotideamasseterica

b) in submandibular triangle, 5.0-5.5sm lance rounding the angle of mandible by mandatory cutting of facia of parotid gland. Cutting layers:
   1. skin
   2. subcutaneous pad tissue

3. continuous of superficial fascia with platizma
4. fascia parotideamasseterica, which in this region is a continuous of superficial layer of deep cervical fascia, which perform hard connective capsule for parotid gland

Between these 2 lances must be performed konrappertura (tunnel). In severe cases, when whole gland is involve into the process, or in case of necrotic process must performed lance by Koftunovich. It starts from upper stage of auricle anteriorly of the ear comes down to the retromandibular region, turned to the submandibular triangle and continuous up to anterior border of masseter muscle. Performed skin-subcutaneous patch, then cut capsule of the gland and get to gland

Pterygomandibular space

Boundaries of the space

Exterior-medial surface of ramus of mandible
Interior-the posterior inferior surface of medial pterygoid muscle
Superior-lateral pterygoid muscle and intrapterygoideal fascia
Anterior-pterygomandibular raphae

Contents

- Inferior alveolar nerve
- Buccal nerve
- Lingual nerve
- Chorda tympani
- Inferior alveolar artery and vein
- First part of maxillary artery

Source of infection The most commonly source of infection are lower and upper third molars. This space can be affected during anesthesia in this area (inferior alveolar nerve block).

Signs and symptoms

1. Intraoral examination may show mucosal edema and erythema with a variable degree of swelling just medial to the anterior border of ramus of mandible, chewing and swallowing functions are painful
2. The area is tender on palpation with pus discharge in the region of mandibular third molar pericoronal flap
3. The jaw opening is limited, as the result of inflammation of the medial pterygoid muscle
4. The pain is constant, because the inflammation include inferior alveolar nerve, lingual nerve and buccal nerve

Approach for incision and drainage

This space can be drained either by an intraoral or extraoral approach

- For intraoral drainage an incision is made along the pterygomandibular raphe
- For extraoral drainage a skin incision is made about 1-1.5cm long and 1.5cm below the lower border of mandible. Medial pterygoid muscle is incised and detached from the bone to open the space.

Parapharyngeal space

Boundaries of the space

Medial - is formed by the levator and tensor welli palatini muscles, and the lateral wall of pharynx (superior constrictor, middle and inferior constrictor muscles)
Lateral - medial pterygoid muscle, parotid salivary gland
Anterior - pterygomandibular raphe
Posterior - the prevertebral fascia with the fascial processus, hyoglossal muscle
Superior-skull base

Contents

This space is separated by stylomandibular ligament, styloglossus, stylohyoid, stylopharyngeal muscles from the anterior and posterior pharyngeal spaces.
The anterior parapharyngeal space includes pharyngeal lobe of parotid gland.
The posterior pharyngeal space involves

- internal carotid artery
- internal jugular vein
- vagus nerve
- glossopharyngeal nerve
- accesory nerve
- hypoglossal nerve
- superior sympathetic ganglions
- lymph nodes

Source of infection

Tonsillar infection can lead to this space, trauma of the lateral wall of pharynx. The space also can get infected from pterygomandibular space infection, or from submandibular and parotid space infection.

Signs and symptoms

Intraoral examination shows inflamed, swollen mucosa along the anterior border of ramus of the mandible and the tonsillar area. Lateral pharyngeal wall may be pushed to the opposite side and so is the uvula. The palpation of submandibular space is painful. The trismus is moderate (the limit of the mouth opening is approximately 2.5-2.8cm). Severe dysphagia, dyspnoea, restricted neck movements are clinical features.

Approach for incision and drainage

The most suitable way of incision and drainage is done by an incision at the angle of the mandible, after cutting through the overlying layers, pterygomasseteric sling is exposed. Without touching the sling, dissection is done medial to the medial pterygoid muscle.
Intraoral incision and drainage is made along lateral wall of pharynx.

Retropharyngeal space

Boundaries of the space

Anterior – posterior pharyngeal wall
Posterior – prevertebral fascia
Superior – skull base
Inferior – upper mediastenum
Laterally – lateral pharyngeal space

The retropharyngeal space is a vertical compartment behind the esophagus and pharynx. Posterior to the retropharyngeal space lies the danger space, which communicates with the posterior mediastenum.

Source of infection

- Nasal and pharyngeal infections
- Trauma
- Tuberculosis of pharyngeal lymph nodes
- Infection from adjacent spaces

Signs and symptoms

- Severe dysphagia
- Dyspnoe
- Restricted neck movements
- Food regurgitation
- Pyrexia

Approach for incision and drainage

Incision is taken along the anterior border of sternomastoid muscle, about 5-7 cm in length .

Sublingual space

Boundaries

Lower – m. mylohyoideus
External – the inner surface of the body of mandibule
Inner – m. genioglossus and m. geniohyoideus
Upper – The mucous membrane of the floor of the mouth

Contents

1. Sublingual salivary gland
2. The duct of submandibulaar gland
3. Lingual nerve (n.lingualis)
4. Lingual vein (v.lingualis)
5. Lingual artery (a.lingualis)
6. Hypoglossal nerve (n.hypoglossus)

Source of infection for sublingual space can be periapical or marginal pyoinflammatory processes of any teeth of lower jaw. The secondary inflammation can spread into this area from submandibular space.

Signs and symptoms

1. Infiltration, edema and hyperemia of sublingual tissues and mucosa, which is covered by fibrous coat. Consequently sublingual fold of affected side move the tongue up and to the healthy side.
2. In the case of bilateral inflammation infiltrated and edematous sublingual fold move the edematous tongue up, in the issue tongue cannot be placed into the oral cavity. Edematous sublingual fold formed a structure like second tongue.
3. Fimbriated folds of the tongue are also edematous and covered by fibrous coat
4. The patients mouth is half opened
5. Swallowing is extremely difficult
6. Breathing is disturbed
7. Speech is unclear
8. There is edema in the anterior part of submandibular and submental areas , the cause is not only reactive edema , but also down pressed mylohyoid muscle by infiltrate. The skin color isn't changed .
9. Submandibular and submental lymph nodes are enlarged and painful.
10. The general condition of the patient is severe

Approach for incision and drainage

The insicion should be done intraorally: in the sublingual mucous at the most pronounced swelling. Area, close to the jaw bone as possible. After that, by blunt dissection we need to reach to the exudate.

Root of the tongue

Boundaries of the space

Upper - The own muscles of the tongue
Lower – Sublingual muscle
Externally – Genio-glossal, hyoglossal, muscles

Source of infection

- Trauma of the tongue
- Lingual glands
- Sublingual space infection
- Submental space infection
- Submandibular space infection

Signs and symptoms

- Edema of the tissues of sublingual space
- The tongue is enlarged in size
- The hyperemia of the tongue and mucous of the floor of the mouth
- There is a hard inflammatory infiltrate at the lower jaw angle area on palpation, which is painful.
- The pain is severe even if no action
- Moderate trismus till 2.5 cm
- Chewing and swallowing is strictly difficult because of severe pain

- Breathing disturbances may be

Approach for incision and drainage

The incision must be done in submental area . The initial incision may be vertical or horizontal, but then it should be only vertically , strictly on a medium sagital line. Then deepening we reach to a pus.

Floor of the oral cavity

Floor of oral cavity divided into upper and lower floors by mylohyoid muscle.

Boundaries of the upper floor

Superior – mucosa of floor of the oral cavity
Inferior – mylohyoid muscle
Anterior and external – internal surface of mandible body
Posterior – root of the tongue

Boundaries of the lower floor

Superior – mucosa of floor of the oral cavity
Inferior – mylohyoid muscle
Anterior and external – internal surface of mandible body
Posterior – root of the tongue

The "floor of the oral cavity" included following spaces – 2 submandibular, submental, 2 sublingual and root of the tongue. In the case of extensive inflammations of the "floor of the oral cavity" it is necessary to perform revision of whole cellular spaces. The lower floor of oral cavity included 7 cellular spaces - 2 cellular spaces in each submandibular space: a) in the intramuscular fissure, between mylohyoid and hyoglossal muscles; b) between body of mandible and submandibular gland. Submental space contains 3 cellular spaces: one between anterior bellies of digastric muscles and 2 between anterior belie of digastric muscles and mylohyoid muscle. The upper floor of oral cavity also included 7 cellular spaces - 2 cellular spaces in each sublingual space: a) around of alveololingual groove; b) around of sublingual gland. Root of the tongue contains 3 cellular spaces- 1 between two genioglossal muscles and 2 between hyoglossal and genioglossal muscles (one from each side). So as a result "floor of the oral cavity" contained of 14 cellular spaces.

Signs and symptoms

General condition of the patient is severe. Intoxication symptoms are present. Externally the face of the patient seems elongated because of the edema in the submandibular and submental areas. The skin covering these areas is hyperemic, there is also an edema present that spreads to the parotid, buccal, and upper areas of the neck, however, there is significantly less swelling and pain because it is collateral edema. The patients mouth will be half opened (cannot close mouth), tongue is raised and partially protruding from the mouth because of sublingual edema. The tongue is dry and is covered by brown plaque. The patients speech is unclear and swallowing is severely painful and nearly impossible. Difficulty in breathing is also present.

Cause of infection for frontal teeth and premolars commonly cause upper floor infection because their root apexes are above than the mylohyoid line. Molar teeth cause lower floor infection because the root apexes are below the mylohyoid lie. The infection can spread from upper to lower floor and visa-versa.

Local symptoms for upper floor:

- Sublingual tissue swelling and hyperemia
- Moderate pain during rest
- Chewing, swallowing, and speech are difficult
- Breathing disturbances, possibly asphyxia

Local Symptoms for lower floor:

- Submental and submandiluar space edema and hyperemia
- Moderate pain during rest
- Chewing, swallowing, and speech are difficult
- Breathing disturbances, possibly asphyxia

Approach for incision and drainage

There are3 types of incisions

- First incision – U-shaped incision: from one angle of mandible to other. It allows us to expose and drainage all 14 spaces and achieved adequate aeration of tissues in case of anaerobe infection.
- Second incision – turned T – shaped incision allows exposing fully the root of the tongue.
- Third incision – 1 vertical in submental space and 1 incision in each submandibular triangle parallel to the lower wall of the mandible. This is the most aesthetic type of incisions, but it can be cause of purulent pockets and as a result can be recurrence of infection.

The similar clinical features of celllulitis of the floor of the mouth and root of the tongue

1. General condition of the patient is severe
2. Severe disturbance of chewing, swallowing, speech and breathing
3. Head position is forced (upward)
4. The tongue is enlarged in size 2-3 times; therefore it does not fit in the oral cavity. The patients mouth is half opened. Severe restriction of tongue movements. there is swelling and hyperemia of the mucous membrane of sublingual space
5. tongue is covered by durty-grey coat
6. viscous saliva
7. smell from the mouth

Differential diagnosis of cellulitis of the floor of the oral cavity and root of the tongue

Signs and symptoms	floor of the oral cavity	root of the tongue
Pain during rest	moderate	severe

General condition of the patient	Can be moderate, severe, extremely severe	Severe due to breathing disturbances
Location of infiltrate	Severe edema of submandibular, submental, sublingual regions	Moderate edema of submental region
Hyperemia of skin surfaces	In case of lower floor is hyperemia of the skin of submandibular, submental, regions	-
Pressure on the tongue by spatula	_	Severe pain
Hoarseness	_	+

Gangrenous cellulitis of the floor of the oral cavity
Ludwig`s angina

It was first described in 1830 by Gensoule, and in 1836 by Ludwig, that`s why it labeled as Gensoule-Ludwig`s angina.

It is gangrenous, fast spreading cellulitis of the floor of the mouth, which characterizes by severe intoxication of organism. There are 2 types of this angina: Senator`s angina, which spreads posterior to the pharynx, and Ludwig`s angina, which spreads anterior to the chin. In 60% of the cases it occurs from the odondogenic source of infection, in 40% it can occurs due to acute tonsillitis, ulcerative stomatitis, etc. The causative factors of this cellulitis are anaerobic streptococcus, anaerobic staphylococcus, in symbiosis with Esherichia coli, clostridium perfringens. In such cases bacteriological verification can takes us some days, but this condition needs on an emergency treatment, that`s why diagnosing can be done by clinical examination.

Signs and symptoms

In difference with traditional infections non-clostridial (anaerobic) lesions have very specific clinical features:

- fever, insomnia, ravings, overexciting (which indicates a poor prognosis)
- skin surfaces are pale with an earth tint
- local symptoms are most weakly expressed
- disease begins as edema of submandibular and submental spaces, which rapid spreads to the surrounding regions (buccal space, neck)
- on palpation edematous tissues of of submandibular and submental spaces are painful, can be felled crepitating due to gas bubbles, fluctuation is absent
- infiltrate has not clear borders, overlying skin is pale
- tongue is moved upward, its movement is difficult
- swallowing is impossible
- severe breathing disturbances
- sublingual fold is covered by fibrous coat, edematous and gets up to crowns of the teeth
- after 3-4 days on the overlying skin of infiltrate appear blue-burgundy spots or cavities
- intoxication will increase, the patient`s general condition will worsens progressively, the temperature will become septic (with big difference in the morning and evening)
- blood test: leucopenia, lymphopenia, the leukocyte formula with left shift.

After incision the changes of tissues of the floor of the oral cavity are very typical:

- absence of pus

- cloudy, bloody, bad smell liquid is released
- presence of gas bubbles
- cellular tissues are infiltrated and partially necrotized
- muscles look like boiled meat
- a large amount of dirty-grey, bad smell necrotized mass
- absence of hemorrhage due to thrombosis of all blood vessels.

Secondary infection can spread into following spaces

1. pterygomandibular space: by the duration of lingual nerve
2. parapharyngeal space: by the duration of styloglossal and glossopharyngeal muscules
3. submandibular space and region of submandibular salivary gland: by the duct of submandibular salivary gland or by the intramuscular fissure, between mylohyoid and hyoglossal muscles
4. sublingual space under the sublingual salivary gland: by the duration of lingual vessels and hypoglossal nerve
5. submental space: in case of presence of diaphragmal process of sublingual salivary gland or throw the mylohyoid muscle.

In the most of the cases such spreading of infection can arise as a result of inadequate evacuation of pus and drainaging. In case of incremental exraoral incisions can be observed necrosis of large amount of skin surfaces. In the acute stage it can leads to the loss of the large amount of liquid from the organism. In subacute stage can arise scar contracture of the neck, which requires reconstructive-plastic surgery.

Approach for incision and drainage

There are3 types of incisions

- First incision – U-shaped incision: from one angle of mandible to other. It allows us to expose and drainage all 14 spaces and achieved adequate aeration of tissues in case of anaerobe infection.
- Second incision – turned T – shaped incision allows exposing fully the root of the tongue.
- Third incision – 1 vertical in submental space and 1 incision in each submandibular triangle parallel to the lower wall of the mandible. This is the most aesthetic type of incisions, but it can be cause of purulent pockets and as a result can be recurrence of infection.

Medical treatment of gangrenous cellulitis includes `

- Antibiotics (last generation)
- Metronidazole, trixopole
- Desintoxication therapy in combination with vitamins
- Diuretics (lazex, furosemide)
- Active drainaging (permanent irrigation) of the wound by 3% hydrogen peroxide, potassium permanganate, enzymes (trypsin, xemotrypsin)