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Acute and chronic infections of the ear, nose and throat

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Any compartment or anatomical region of the head and neck may become infected. Life-threatening complications may arise from any site. Infection of the nasal and paranasal sinus may spread centrally with or without orbital involvement and visual loss; infections of the external or middle ear may spread intracranially; infections of the neck space may compromise the airway and/or track to the mediastinum.

This contribution will focus on infections that present with external signs, require surgery and carry the risk of life-threatening complications.

Ear

Perichondritis

Infective perichondritis is characterized by pruritus, pain, induration, oedema and erythema over the auricle. Cellulitis of overlying soft tissues may spread to the face. Infection may be secondary to skin wound inoculation (e.g. after piercing) or may complicate a subperiosteal haematoma caused by blunt trauma to the pinna. Diabetic patients can suffer from spontaneous perichondritis.

Treatment – antibiotics against staphylococci and streptococci are given intravenously. Surgical drainage of any haematoma and pus is mandatory; splinting is necessary to obliterate dead space. Needle aspiration is rarely effective. Loss of cartilage and organization of the haematoma can lead to cosmetic deformity which may require reconstruction later.

Otitis externa

Non-specific acute otitis externa is an infection of the skin and soft tissues of the ear canal. It is usually caused by dermatitis and colonization by opportunistic Gram-negative bacteria. If the infection spreads to the post-auricular soft tissues (with or without involvement of the regional lymph nodes), it may be confused with mastoiditis.

Treatment is clearance of the debris from the ear canal with local dressings, local antibiotics corresponding to culture and sensitivity and corticosteroids. A normal appearance of the tympanic membrane excludes mastoiditis.

Necrotizing otitis externa is a potentially lethal infection of the ear canal and surrounding tissues. It is commonly seen in diabetic and immunocompromised patients, and is characterized by deep-seated aural pain, chronic purulent secretions, aural fullness, granulation tissue in the ear canal, and cranial nerve palsies.

The causative pathogen is usually Pseudomonas aeruginosa. The exotoxins and elastase produced by Pseudomonas aeruginosa lead to a necrotizing vasculitis with destruction of the local tissues. The disease spreads from the external auditory meatus (through naturally occurring fissures, sutures and Santorini’s cleft) to the surrounding structures. Involvement of the tympanic plate, mastoid tip and stylomastoid foramen leads to early facial nerve palsy. With progression of the disease, other cranial neuropathies occur, the ninth, tenth, eleventh nerves (due to spread of the infection to the jugular foramen) and the twelfth nerve (due to involvement of the hypoglossal canal) are usually involved.

Treatment – triple antibiotic therapy with metronidazole (i.v.) gentamycin (topical) and ciprofloxacin (oral) may be required initially for all cases. Treatment includes microscope-aided aural toilet, analgesia and aggressive control of co-existent medical disorders (e.g. diabetes). Hyperbaric oxygen and surgical debridement (including sub-total petrosectomy) should be considered in refractory cases. Despite this treatment, mortality rates range from 23% to 37%, and rise to 60% in cases with multiple cranial nerve involvement.

Infections of the middle ear

Acute purulent otitis media with mastoiditis: acute coalescent mastoiditis is a complication of acute purulent otitis media and may complicate chronic disease of the middle ear. The infection causes bony destruction of the septa of the mastoid air cells.

Clinical signs are pyrexia, tenderness and erythema over the mastoid, with retroauricular swelling and anterior displacement of the pinna.

Treatment is with antibiotics given intravenously with or without insertion of a middle ear ventilation tube. If a subperiosteal abscess forms over the mastoid tip, surgical drainage and cortical mastoidectomy is indicated. Tracking of infection from the mastoid process along the digastric, sternocleidomastoid, splenius and longissimus capitis muscles may occur, with formation of a lateral neck abscess (Bezold’s mastoiditis), which will also need incision and drainage, although this complication is rare. The infection may also affect the facial nerve, causing lower motor neurone palsy. Infection may spread to the inner ear, causing labyrinthitis and a ‘dead ear’ (complete hearing loss) and disturbance of balance. Surgical exploration of the middle ear is required urgently in such circumstances.

Intracranial complications of otitis media are discussed in ‘Intracranial complications of diseases of the ear, nose and throat’, page 175.

Nose

Nasal vestibule furuncle

Symptoms of a nasal vestibule furuncle include marked local pain, extreme sensitivity to pressure with redness and swelling of the nasal tip, nasal alar margins and upper lip.

Treatment consists of antibiotics given intravenously; surgical incision and drainage under general anaesthesia may be needed.

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One should avoid evacuating the pus manually because it may lead to intracranial spread via the angular and ophthalmic veins and the cavernous sinus. Thrombophlebitis of the angular vein may lead to cavernous sinus thrombosis.

**Rhinovirus, Coronavirus influenzae, Parainfluenza virus, various bacteria (particularly pneumococci, Haemophilus influenzae, haemolytic streptococci, staphylococci, Branhamella catarrhalis, coliforms) and fungal pathogens.**

The infection can spread through bony fissures, along thrombosed veins or may metastasize and lead to orbital or intracranial complications. Most of these complications are secondary to acute bacterial or fungal infections. Specific areas of weakness are found in the lamina papyracea, which is thin and weak (and which may be dehiscent in the very young). A coryzal illness can lead, especially in young children, rapidly to a complicated ethmoiditis.

**Pott’s puffy tumour:** in severe cases of frontal sinusitis, infection can result in anterior table osteomyelitis and spread into the soft tissues of the forehead causing a prominent swelling (Pott’s puffy tumour).

*Treatment* is the drainage of the frontal sinus and broad-spectrum antibiotics given intravenously. Drainage may require endonasal, endoscopic sinus surgery (with or without a combined transfacial external approach). Osteomyelitic bone may require debridement.

**Orbital cellulitis:** the Chandler, Langenbruner and Smith classification distinguishes five types of orbital cellulitis (Figure 1). The common first sign is a swollen upper eyelid (Figure 2). With disease progression, symptoms of proptosis, pain, ophthalmoplegia and visual disturbances develop. Damage of the optic nerve can occur due to the release of endo- and exotoxins by pathogens or due to increased pressure in the orbit. Visual loss can be rapid.

CT scanning (Figure 3) aids diagnosis, provides the anatomical information necessary for surgery and gives details of spread of the disease.

*Treatment* – antibiotics given intravenously are the first step. However, subperiosteal and orbital abscesses with raised intraorbital pressure require urgent surgery to prevent permanent visual

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**Chandler, Langenbruner and Smith classification of orbital cellulitis**

| Type | Name                          | Extent of disease                                      | Diagnosis | Treatment                                             | Prognosis          |
|------|-------------------------------|-------------------------------------------------------|-----------|-------------------------------------------------------|--------------------|
| I    | Pre-septal cellulitis         | Infection confined anteriorly to the tarsal plate       | Clinical  | antibiotics (i.v.), nasal decongestants               | Good               |
| II   | Post-septal cellulitis        | Infection spread beyond the tarsal plate without subperichondral collection | CT        | antibiotics (i.v.), nasal decongestants               | Good               |
| III  | Post-septal cellulitis with subperichondral abscess | Infection spread beyond the tarsal plate with subperichondral collection | CT        | antibiotics (i.v.), incision and drainage of abscess  | Good               |
| IV   | Orbital abscess               | Infection spread beyond tarsal plate, but confined to the orbit | CT        | antibiotics (i.v.), nasal decongestants, drainage of abscess | Good (If recognized early) |
| V    | Cavernous sinus thrombosis    | Infection spread beyond tarsal plate spread beyond the orbit | CT        | antibiotics (i.v.), nasal decongestants, drainage of sinuses and abscesses, thrombolysis or thrombectomy | Poor               |
**Borrelia vincentii** is primarily a viral infection and pharynx. Symptoms include pain, haemorrhage and a necrotic gingiva, but which may spread to the oral mucosa, tongue, palate, able ulceration of the mucous membranes that usually affects the Vincent's angina usually sufficient.

Antibiotic treatment (penicillin given orally for seven days) is ditis or myocarditis, acute glomerulonephritis or focal nephritis. Complications such as septicaemia, rheumatic fever, endomyocarditis, endocarditis or myocarditis, acute glomerulonephritis or focal nephritis. Antibiotic treatment (penicillin given orally for seven days) is usually sufficient.

**Ludwig's angina** is a progressive brawny oedema and cellulitis of the floor of the mouth and submandibular and submental spaces secondary to soft tissue infection, tonsillar infection and infection of the lower premolar and molar teeth. More than 80% of patients have dental disease. The most common pathogens are *Streptococcus viridans* and *Escherichia coli*. When the infection spreads to the sublingual space, the floor of the mouth becomes very swollen. The tongue is pushed posteriusorly and respiratory obstruction may occur.

**Treatment** – tracheostomy (see ‘Percutaneous tracheostomy’, page 194) should be considered early as an elective procedure. Tracheostomy under local anaesthesia may be necessary because oral or nasal intubation may be very difficult if oedema is considerable, and attempts at intubation may induce complete obstruction of the airway. The infection usually responds to antibiotics given intravenously, so incision and drainage should be postponed for as long as possible, particularly because single, large collections of pus are rare.

**Infections of the larynx**

Laryngo-tracheobronchitis is primarily a viral infection and mainly affects children. The disease is most common between the first and fifth year. Following a cold, a dry, barking cough becomes rapidly worse. Hoarseness with inspiratory and expiratory stridor develops and the infection may lead to severe respiratory distress. Clinical signs also include a tracheal tug and intercostal recession. The infection is common in autumn and winter. The viral infection leads to a generalized oedema of the airway and secondary bacterial superinfection usually occurs. Laryngoscopy reveals glottic mucosal oedema, redness and possible crust formation.

**Treatment** – severe cases need hospitalization, broad-spectrum antibiotics, oxygen therapy, corticosteroids, epinephrine nebulizers and, in extreme forms, endotracheal intubation.

**Acute epiglottitis** can be life threatening and the main pathogen is *Haemophilus influenzae* type B. The disease used to affect mainly children, but its incidence has decreased dramatically due to the introduction of vaccination. It is now mainly seen in adults and is associated with supraglottitis. Predominant symptoms are inspiratory stridor and acute obstruction of the upper airway. The patient sits upright in the ‘sniffing air’ position. The neck is extended and the chin elevated. Examination of the oral cavity may lead to complete obstruction of the airway, hence preparation for intubation or tracheostomy must be made before any examination of the airway and laryngoscopy.

**Oral cavity**

**Infections of the oral cavity and pharynx**

Acute tonsillitis is characterized by pain, pyrexia, and odynophagia with difficulties in swallowing with or without trismus. Indications for hospital admission are dehydration, peritonsillar abscess formation (quinsy) or obstruction of the upper airway. The most common pathogen is *group A streptococcus*. Complications include local spread of the infection, local abscess formation (in the form of a peri-, para- or retropharyngeal abscess) and systemic complications such as septicaemia, rheumatic fever, endomyocarditis or myocarditis, acute glomerulonephritis or focal nephritis. Antibiotic treatment (penicillin given orally for seven days) is usually sufficient.

Vincent’s angina is an acute infection of the mouth, with considerable ulceration of the mucous membranes that usually affects the gingiva, but which may spread to the oral mucosa, tongue, palate and pharynx. Symptoms include pain, haemorrhage and a necrotic odour. If the tonsils are affected, the patient usually complains of unilateral pain on swallowing and ipsilateral lymphadenopathy in the jugulodigastric area. Examination of the oropharynx reveals an ulcer, usually in the upper pole of the tonsil with a whitish exudate. The patient may complain of having a foreign body in the throat (see ‘Foreign bodies in the ear, nose and throat’, page 182) and will have a characteristic oral fetor. The infection is caused by *Borrelia vincentii* and *Bacillus fusiformis*.

Diagnosis is made from the clinical picture and microbiological tests. Because of the unilaterality of the symptoms with the associated lymphadenopathy, the infection is easily mistaken for a malignancy. Antibiotic treatment (penicillin given orally for seven days) is usually sufficient.

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Treatment consists of broad-spectrum antibiotics given intravenously, oxygen therapy, corticosteroids and epinephrine nebulizers. If conservative treatment fails, the airway is secured by nasotracheal intubation. Tracheotomy is rarely required. The disease usually improves within a few days. Possible complications are epiglottic abscess and perichondritis.

Infections of the major salivary glands
Infections of the major salivary glands are discussed in ‘Non-neoplastic disease of the salivary glands’, page 173.

Infections of the neck

Superficial infections: furuncles and carbuncles are the most common infections, followed by infected epidermoid cysts. The pathogens are usually staphylococci. Treatment – furuncles and carbuncles are surgically drained; infected epidermoid cysts need complete excision after antibiotic treatment.

An infected branchial cyst should initially be aspirated (rather than incised or excised) to prevent fistula formation and should be removed after resolution of the acute infection. Antibiotics given orally are usually sufficient. Definitive treatment is excision, including any associated ductal elements. Full otorhinological examination (including fibreoptic naso-laryngo-pharyngoscopy) before excision is necessary to ensure that the lesion is not an infected metastatic lymph node. Fine-needle aspiration cytology should be performed following resolution of infection. In a patient aged > 45 years, before cyst excision, guided biopsies of possible primary tumour sites (including the ipsilateral tongue base and pyriform fossa) and an ipsilateral tonsillectomy should also be performed. The histology should be awaited to ensure the neck cyst is not a metastasis from a missed primary malignant neoplasm. If the results are negative for primary tumour, the skin incision line used for cyst excision should be placed to allow for later incorporation into an incision for a neck dissection.

Cervical abscess: abscess formation in a cervical space is usually secondary to necrosis or inflammation of a regional lymph node. Common pathogens are staphylococci, streptococci, Gram-negative organisms, anaerobes and, less commonly, tuberculous bacilli. The site of the inflammatory process determines the clinical picture. Peri-, para- retropharyngeal and submental or submandibular spaces are usually involved. Tuberculosis can lead to a so-called ‘cold’ abscess or ‘collar stud’ abscess with or without fistula. Treatment of a simple cervical abscess is incision and drainage, antibiotics given intravenously and analgesia. For a cold abscess, the excisional biopsy should be followed by a six month course of antituberculous chemotherapy.

Parapharyngeal abscesses are more common in adults than in children. They are a complication of tonsillitis in 60% of cases and a complication of extraction of a lower molar tooth in a further 30%. They have been reported as a complication of tonsillectomy.

Symptoms include pain and trismus due to involvement of the medial pterygoid muscle. The tonsil is displaced medially, but looks normal. The abscess causes a marked swelling at the posterior border of the middle one-third of the sternocleidomastoid muscle in the neck. Ultrasound or CT scan confirms the diagnosis.

Treatment includes incision and drainage, antibiotics given intravenously, and analgesia. Untreated, the abscess may lead to septicaemia, thrombosis of the internal jugular vein, erosion of the carotid artery or ascending intracranial spread of the infection.

Retropharyngeal abscesses occur in infants and young children. In children, the retropharyngeal space contains one or two lymph nodes and suppurative lymphadenitis secondary to an upper airway infection can lead to abscess formation. Symptoms include sore throat, swinging pyrexia, dysphagia, drooling of saliva and neck swelling. The swelling can obstruct the posterior nares and, due to the high location of the larynx, can cause obstruction of the upper airway. In adults, the spread of a tuberculous infection of the cervical vertebrae can lead to retropharyngeal abscess. A soft tissue lateral radiograph (or CT scan) of the neck shows the characteristic swelling of retropharyngeal space (Figure 4).

Treatment includes per-oral drainage of the abscess, broad-spectrum antibiotics given intravenously, analgesia and rehydration and, in the case of tuberculosis, appropriate long-term antibiotics. Any underlying immune deficiency should be investigated and treated. Untreated, the abscess may lead to septicaemia or lower respiratory tract inhalation of pus, descending mediastinitis or ascending intracranial spread.

Submental/submandibular abscess: an abscess in the submental and submandibular spaces has been described in the section on Vincent’s angina and submandibular disease including Ludwig’s angina.

A cold abscess accompanies tuberculous cervical lymphadenitis. It develops slowly, with limited inflammation and becomes painful when there is pressure on the surrounding tissues. The incidence of coexisting pulmonary tuberculosis at the time of cervical tuberculosis is 5%. Usually, the tonsil is the source of cervical tuberculosis.

Treatment is excisional biopsy followed by a 6-month course of antituberculous chemotherapy. If excision is not followed immediately by chemotherapy, a sinus may develop. Selective neck dissection has been described for recalcitrant cervical mycobacterial infection.