Neck emergencies: no more fear

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Authors: J. M. Marin¹, C. Ferreiro Arguelles², P. Núñez Valentín¹, A. Velarde Pedraza², J. L. Cervera Rodilla²; ¹Leganés/ES, ²Madrid/ES
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Learning objectives

The purpose of this exhibit is:

- To review the most common -and some not so common- head and neck emergencies and to discuss their radiological findings.

- To review the better imaging tool and protocol to study these patients according to their age, clinical presentation, and risk of development of further complications.

- To familiarize residents and general radiologists with acute neck pathologies in a friendly format way.
Background

There are several entities that may present as an emergency of the head and neck. Many of them carry highly morbi-mortality due to the complex and interconnected anatomy of these regions that favours the spread of the disease. Furthermore, they can affect vital organs that have low tolerance to inflammation, infection and injury.

Almost all of these pathologies result in significant suffering, impairment of function, even the death of the patient if they are not properly diagnosed. Now we have widely available and highly specific radiology techniques that lead to a correct diagnosis in most cases. Therefore is mandatory to the resident and the general radiologist to know the most common entities that can affect the head and neck in adults and children. Furthermore, they must be familiar with those processes that are not so common, but may endanger the patient’s life quickly.

The purpose of this exhibit is to review the most common -and some not so common- head and neck emergencies, using a friendly approach based on clinical cases, in which the patient's medical information given have helped us to perform a study adjusted to the patient's needs and to narrow the diagnosis.
Findings and procedure details

ORBITS AND SINUSES

Orbital infections:

Those infections confined to the soft tissues anterior to the orbital septum are called periorbital or preseptal cellulitis. Fig. 1 on page 14

They constitute the vast majority of the emergent orbital infections and are caused by spread of skin (face, eyelid), teeth and ocular adnexa infections. On CT scans diffuse soft tissue thickening and oedema are seen.

Streptococcus, Staphylococcus, Pneumococcus, and Pseudomonas are among the most common infecting organisms. The patient usually responds to appropriate oral antibiotic therapy.

Infectious involvement of the soft tissues posterior to the orbital septum is the imaging hallmark of orbital postseptal cellulitis. It predominantly affects children and adolescents and tends to have a more severe course in older patients. Patients usually complain of visual loss, exophthalmos, restricted ocular movements, injection and bogginess of the conjunctiva (chemosis).

Orbital cellulitis is usually secondary to extension of paranasal sinus infection.

The key-imaging feature of this condition is stranding of the intraorbital fat. Fig. 2 on page 14

Ophthalmic vein thrombosis, cavernous sinus thrombosis, meningitis and intracranial abscess are the most feared complications; so contrast-enhanced CT or MRI images are required promptly in the patient assessment in order to establish an accurate diagnosis and proper treatment. Aggressive intravenous antibiotic therapy is required and surgical drainage may be needed if a subperiosteal abscess is present.

Non-infectious orbital inflammation:

Non-infectious diseases of the orbit may present with pain, acute loss of vision, proptosis, diplopia, or restricted ocular motility and require urgent evaluation. They constitute a large
list of inflammatory (idiopathic) diseases and are generally referred to as idiopathic orbital inflammatory syndrome or orbital pseudotumor because of their tendency to cause mass effect.

Inflammatory changes of the postseptal soft tissues are not necessarily specific on imaging and are not always diagnostic. Imaging helps to identify the process and the structures involved.

In general, inflammatory non-infectious diseases of the orbit are associated with several systemic and autoimmune conditions, so they must be rule out.

Any of these conditions may manifest as a hyper cellular, infiltrative intraorbital soft tissue mass with characteristic enhancement. Fig. 3 on page 15  Fig. 4 on page 16

**Dacryocystitis:**

This condition refers to inflammation and/or dilatation of the lacrimal sac that results from the obstruction of the nasolacrimal drainage, which may be congenital or acquired.

Patients often present with pain, epiphora, erythema, and edema in the region of the medial epicanthus and lacrimal puncta. Mucopurulent discharge from de puncta and conjunctivitis can also be seen.

Contrast-enhanced CT shows a well-circumscribed round lesion that is centered at the lacrimal fossa with peripheral rim-like enhancement. Fig. 5 on page 17

**Bacterial sinusitis:**

Viral agents cause most acute rhino-nasal infections, therefore they have a self-limited course. However, persisting or worsening of symptoms such as fever, retrobulbar pain, chemosis or periorbital edema, should raise concern about more serious bacterial infection and the presence of complications.

The patient often presents with fever, headache, postnasal discharge of thick sputum, nasal congestion and abnormal smell. Bacterial sinusitis usually follows a viral upper respiratory tract infection. Most bacteria are introduced to the sinus cavities via the nasal mucosa and are caused by Staphylococcus, Haemophilus, Streptococcus, and Moraxella species. Fig. 6 on page 18

Tooth caries, periapical abscess and oroantral fistulation lead to spread of infection to maxillary sinus. Differentiating between sinusitis caused by obstructed drainage
pathways and odontogenic disease is important to direct patients to the most appropriate treatment. Failure to identify the source of odontogenic disease leads to recurrent sinusitis after cessation of antibiotic therapy. Fig. 7 on page 19

CT shows mucosal thickening and enhancement and opacification of sinuses. Air-fluid levels are a non-specific finding but helps to identify acute bacterial sinusitis.

When not properly controlled, acute bacterial sinusitis has the potential to extend to adjacent structures causing complications such as subperiosteal abscesses, meningitis, epidural or subdural empyema, cavernous sinus thrombophlebitis, among others.

**Acute invasive fungal sinusitis**

Being the most aggressive type of sinusitis, acute invasive fungal sinusitis is rapidly progressive and carries the worst prognosis. This infection is almost exclusively encountered in patients with impaired immune systems (AIDS, organ transplantation, chemotherapy) or in major systemic preexisting conditions (diabetes, cirrhosis, renal failure) and typically results from mucormycosis or aspergillosis. Fig. 8 on page 20

Its hallmark is the rapid progression through the sinus wall by vascular invasion, causing rapid orbital and intracranial extension.

Patients usually present with fever, symptoms associated to common sinusitis, facial pain, cutaneous and mucous ulcers. Imaging findings resemble those of bacterial sinusitis with opacification of the involved sinus and high-attenuation secretions. Erosion of the sinus wall, fat stranding of the periantral planes and invasion of the adjacent structures raise the suspicion of invasive disease.

Severe complications, if not appropriately treated, include -among others - development of orbital infection, meningitis, empyema, cerebritis/cerebral abscess and cavernous sinus involvement. Fig. 9 on page 21

Despite aggressive antibiotic and surgical therapy the overall mortality rate remains high.

**Epistaxis**

Usually nosebleeds are self-limited conditions with no significant clinical consequences. Most cases are associated with irritation or injury to a rich vascular plexus (Kiesselbach plexus) within the anterior nasal septum and easily treated with transient pressure. Any process that irritates the normal vasculature can induce epistaxis, but sometimes (recurrent) epistaxis indicates more serious conditions such as benign and malignant neoplasms, iatrogenic trauma, and vascular malformations, etc. Fig. 10 on page 22
TEMPORAL BONE

Acute otitis media and mastoiditis

These conditions are defined as inflammation involving the middle ear and mastoid cells, resulting from Haemophilus or Streptococcus infection in the setting of impaired drainage of the mastoid air cells and tympanic spaces. Fig. 11 on page 23 They are among the most common infections in the first 5 years of life; easily diagnosed clinically, rapidly resolving after antibiotic treatment.

The adult patient usually presents with fever, otalgia, otorrhea and postauricular headache, while younger children present with non-specific symptoms such as irritability and difficulty with feeding.

As seen in acute sinusitis, the presence of air-fluid levels in the mastoid air cells is very suggestive of acute otomastoiditis. Fig. 12 on page 24

Also, otomastoiditis can be further complicated by extension of the infection to the adjacent tissues. Externally directed extension in the overlying soft tissues may manifest as subperiosteal abscess formation along the mastoid process surrounded by periauricular cellulitis. Additional complications include labyrinthitis, cranial nerves palsy, meningitis, brain / epidural abscesses and venous thrombosis. Fig. 13 on page 25

Severe otomastoiditis can also progress along the septations of the mastoid process, resulting in their eventual breakdown.

SALIVARY GLANDS

Sialadenitis and parotiditis

Patients with sialadenitis present with fever, facial swelling (usually unilateral), tenderness and salivary pain that is exacerbated by eating (salivary colic). Acute parotitis can be also associated with facial paresis and taste disturbances.

Common etiologies are S. aureus, sometimes secondary to an obstructing sialolith, and mumps (paramyxovirus) in young nonimmunized patients.
Contrast-enhanced CT depicts edematous gland that is enlarged and enhancing with ductal dilatation secondary to a calculus or stenosis. Fig. 14 on page 26 On US salivary glands appear round, hypoechoic and hypervascular at color Doppler US. US is performed mainly to exclude the presence of abscess or calculi. Fig. 15 on page 27

Salivary abscess is sometimes difficult to differentiate from edema, cellulitis and ductal-acinar dilatation. The key features are low-attenuation fluid collection with peripheral rim-like enhancement. Fig. 16 on page 28

The treatment of acute bacterial sialoadenitis includes wide-spectrum antibiotics, hydration, and salivatory promoters (lemons).

**CERVICAL SPACE**

Anatomic overview Fig. 17 on page 29 Fig. 18 on page 30 Fig. 19 on page 31 Fig. 20 on page 32

**Oral cavity infections**

Oral cavity infections (sublingual, buccal and submandibular spaces) are frequently secondary to periodontal disease. Infections of the inferior second or third molar involve more frequently the submandibular space because the roots of these teeth extend below the insertion of the mylohyoid muscle. If more anterior inferior teeth are affected, the infection is confined to the sublingual space. Cortical dehiscence is more common at the lingual aspect of mandible than on the buccal aspect, because of its thicker cortical. Fig. 21 on page 33

Patients usually presents with facial swelling, dysphagia and odynophagia. Contrast-enhanced CT scanner is the appropriate technique to assess the oral cavity, because it helps to depict the source of the infection and detect complications such as myositis, osteomyelitis and abscess formation. Fig. 22 on page 34

Periodontogenic abscess is treated with tooth extraction and wide-spectrum antibiotic therapy.

Ludwig angina is a type of floor-of-mouth infection, a type of cellulitis, rapidly progressive and life-threatening condition, caused by Streptococcus organisms. Prompt aggressive antibiotic therapy and airway control are always needed.

**Descending necrotizing mediastinitis**
It's a rare complication of periodontal and deep neck infections, with a high mortality rate if not promptly diagnosed and treated.

The infection spreads through the "danger space" (retropharyngeal space) or through the carotid space, into the mediastinum aided by gravity.

Often, the diagnosis is delayed because of the subtle, non-specific symptoms and clinical findings.

Contrast-enhanced CT scanner is the appropriate technique because allows the detection of the source of the infection and the route of spread.

CT findings include mediastinal air and fluid collections, stranding of the mediastinal fat, pleural and pericardial effusions. Fig. 23 on page 35

This condition is potentially life threatening and can be associated with severe sepsis and cardiovascular collapse. Aggressive treatment includes intensive care with airway management, broad-spectrum antibiotics and surgical debridement and drainage.

**Oropharyngeal infections**

Tonsillitis and peritonsillar abscess are the commonest deep neck infections among young people, constituting one third of all soft tissue abscesses of the neck.

The patient usually complains of severe sore throat, fever, trismus, tonsillar enlargement and cervical lymphadenopathy.

The most common pathogens are B-hemolytic Streptococcus, S. aureus, Pneumococcus and H. influenza.

Contrast-enhanced CT images show tonsillar edema, enhancement and enlargement of palatine tonsils and posterior pharyngeal soft tissues. When sufficiently big, the tonsils can contact in midline (kissing tonsils). The infection can extend to the parapharyngeal, masticator and submandibular space and form a peritonsillar cellulitis that if not properly treated can develop a peritonsillar abscess. Fig. 24 on page 36

Peritonsillar cellulitis can resolve with intravenous antibiotic therapy, but peritonsillar abscess requires surgical drainage.

**Infectious cervical lymphadenopathy**
Several infectious processes may cause enlargement of cervical lymph nodes, which is referred to as "reactive" lymphadenopathy. Suppurative adenitis indicates an infected node that has undergone liquefaction necrosis.

The most common cause of cervical lymph node enlargement, which is most frequent in children, is viral infection of the upper respiratory tract. Bacterial infections are the most common cause of suppurative cervical adenitis with Staphylococcus and Streptococcus being the most common etiologic agents.

The differential diagnosis is broad and depends on patient demographic, immune system status and presenting symptoms. Fig. 25 on page 37

Tuberculous lymphadenitis (scrofula) is the most common form of head and neck tuberculosis, with increasing incidence because the high prevalence of HIV infection and AIDS. The etiology may be M. tuberculosis or nontuberculous mycobacterium. This infection may involve a single lymph node or may be bilateral, causing painless lymphadenitis. Pulmonary tuberculosis usually is absent.

CT usually shows enlarged lymph nodes with homogeneous contrast enhancement. As the disease evolves, central necrosis can be detected as foci of low density associated with peripheral rim enhancement. Healed lesions and nodes may show calcifications. Fig. 26 on page 38

**Retropharyngeal infections**

Usually results from spread of infection from a site that primarily drains to the lymph nodes of retropharyngeal space. Such infections are tonsillitis, pharyngitis, otitis and oral cavity infections.

Common bacterial agents are the same as described above for oropharynx infections.

Once involved, affected lymph nodes enlarge and suppurate. Adjacent retropharyngeal cellulitis may be present and, if left untreated may become a retropharyngeal abscess. Fig. 27 on page 39

Direct spread of adjacent diskitis or direct inoculation from trauma, may lead to a retropharyngeal abscess.

Contrast-enhanced CT or MR images can locate the infection and differentiate from retropharyngeal edema or abscess formation. Also these techniques are useful to identify potential complications such as compromised airway, descending mediastinitis, venous
thrombosis, and spread of the infection to other spaces, among others. Fig. 28 on page 40

Prognosis is good if retropharyngeal abscess is readily diagnosed and aggressive antibiotic therapy is given. Surgical debridement may be necessary.

**Perivertebral space**

Pathology in this space typically arises from cervical diskitis, trauma or as direct extension from the retropharyngeal space. Fig. 29 on page 41

Diskitis results from direct inoculation from penetrating trauma or surgery, or from haematogenous spread of infection. S. aureus is the most frequent pathogen.

The patient usually complains of cervical and back pain, fever, torticollis, and myelopathy and is usually associated to debilitating diseases or impairment of the immunity system.

MRI is the best technique to detect early diskitis and/or osteomyelitis when CT is usually normal. MR imaging has high sensitivity for the diagnosis and can better characterize the extension and spread of the disease. Fig. 30 on page 42

More apparent findings are vertebral collapse, paraspinal and epidural soft tissue inflammation and fluid collections.

If the patient is neurologically and hemodynamically stable, a needle biopsy is performed before the beginning of the antibiotic therapy. Surgical decompression is needed if cord compression is present.

**Vascular space**

The most frequent emergent process in this space is jugular vein thrombphlebitis.

The patient presents with erythema, tenderness and neck pain.

Contrast-enhanced CT images show an enlarged occluded vein with inflammatory changes on adjacent tissues and vessel wall enhancement. Aggressive antibiotic therapy may be administered in order to treat any underlying infection.

Pulmonary embolism is not frequent but the superior aspect of the thrombus must be identified because of the risk of dural sinus thrombosis.
Lemierre syndrome is a rare and potentially life threatening condition, usually resulting as a complication from acute respiratory tract infection. Usually presents in immunocompetent patients. Fusobacterium, an anaerobe pathogen from oral cavity flora is the most frequent etiology. Septic jugular vein thrombophlebitis, disseminated abscesses and pulmonary septic emboli are seen in this syndrome. Fig. 31 on page 43  Fig. 32 on page 44

MISCELLANEOUS

FOREIGN BODY ASPIRATION AND INGESTION

Young children -under the age of 3 years- are at highly risk of aspiration or ingestion of foreign bodies, a potentially life threatening condition that has to be promptly suspected and diagnosed.

The vast majority of aspirated foreign bodies are encountered at the right main bronchus and less often in the upper airway. Also, they may be lodged at the esophagus, typically oriented in a craniocaudal direction, behind the trachea.

Small seeds and nuts are the most frequent organic foreign bodies while inorganic foreign bodies vary dramatically and include coins, teeth, pins, pens, etc.

Usually there is an episode of choking and the patient presents with abrupt onset of respiratory distress and paroxysmal cough. When the foreign body is ingested, the patient may present with irritability, salivation and poor feeding.

If the patient is stable, neck-chest anteroposterior and lateral radiography are performed. Unfortunately most of foreign bodies are radiolucent, resulting in apparently normal radiographs. Fig. 33 on page 45

Diagnostic (and often therapeutic) bronchoscopy is performed in the presence of positive findings at clinical, physical, or radiographic examination. With early recognition, the mortality from airway foreign bodies is less than 1%.

THYROID HEMORRHAGE

Thyroid hemorrhage is usually a minor condition that causes little to no symptoms. Usually patients present with neck pain and discomfort. However, significant hemorrhage into a thyroid cyst or nodule can cause a rapid expanding hematoma with significant neck swelling and acute airway obstruction. Fig. 34 on page 46
This event may occur spontaneously, after exertion or trauma (accidental, iatrogenic).

The most likely mechanism that may lead to hemorrhage into a goiter is abnormal vascularization or arteriovenous shunting into the cyst/nodule. The management includes airway control, fine-needle aspiration and drainage of the hematoma and definitive management with thyroidectomy.
Fig. 1: The content of the orbit is divided by structures that act as partitions: the periosteum, rectus muscles, orbital septum (thin sheet of fibrous tissue that originates from the orbital periosteum and is inserted at the eyelid tarsus) and Tenon’s capsule (fibrous capsule surrounding the eye from the limbus to the nerve). Therefore the orbital content is divided into spaces or compartments from the outside to the inside:
- Preseptal space: anterior to the orbital septum. It contains the eyelid fat and lacrimal gland.
- Postseptal space: posterior to the orbital septum. It can be subdivided into: Subperiosteal or periorbital space: virtual space between the periosteum and the orbital walls. Peripheral or extraconal space: between the periosteum and the orbital cone (rectus muscles). Intracanal space: inside the orbital cone. Orbital apex: in communication with the optical channel and the orbital groove.

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Fig. 2: A 8 year-old girl with viral sinusitis was receiving symptomatic treatment by her paediatrician. 4 days later presents with facial oedema, erythema, chemosis and severe ocular pain. Orbital cellulitis with sub periosteal orbital abscess resulting from extension of paranasal infection. Axial (A and B) and coronal CT images demonstrate opacification of the right frontal and ethmoid sinuses (red asterisk in A), important swelling and thickening of soft tissues of the left orbit (arrow in A), signs of postseptal cellulitis consisting in thickening of the retro-orbital fat (asterisk in B) and a small sub periosteal abscess (arrow in C). The patient followed an aggressive antibiotic therapy with progressive and complete remission.

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**Fig. 3:** A 45 year-old previously healthy patient with 3-week history of facial hypoesthesia and diplopia that presents at the emergency room with intense ocular pain and chemosis in the right eye. Tolosa-Hunt syndrome. Axial FFE-T1 contrast-enhanced MRI images show thickening and abnormal enhancement of right cavernous sinus and orbital apex (arrows). The patient received high-dose of intravenous corticosteroid therapy with progressive and complete remission of the symptoms.

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Fig. 4: A 50 year-old female patient presenting with 5-day history of right proptosis and impaired ocular movements. She had two-year history of pulmonary sarcoidosis with current clinical remission. Orbital and meningeal sarcoidosis. A-B Coronal and axial contrast-enhanced CT images show a right orbital extraconal mass (asterisks) that enhances homogeneously. C-B Coronal and axial contrast-enhanced MR images confirm the extraconal right orbital mass (white arrows) that associates meningeal enhancement (red arrows). The patient received high-dose of corticosteroids with progressive remission of the symptoms.

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Fig. 5: A 37 year-old patient with 3-day history of painful mass at the medial canthus of the right eye. Dacryocystocele. Coronal and axial contrast-enhanced CT images show homogeneous, well-defined, thin-walled mass with fluid attenuation involving the medial canthus of the right orbit (arrows). The patient received conservative therapy with antibiotics and analgesics.

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Fig. 6: Coronal graphic of right sinonasal region shows important structures around maxillary sinus.

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**Fig. 7:** A 62 year-old patient presenting with high fever, left exophthalmos, facial pain and trismus. He had history of poor dental hygiene. Odontogenic left maxillary sinusitis with postseptal orbital cellulitis. Axial and coronal CT images with soft tissue and bone window settings, show complete opacification of left maxillary sinus with expansion of the ostiomeatal complex (asterisk in B), consistent with acute sinusitis. The infection extents to the masticator space (asterisk in A). Early postseptal orbital cellulitis is indicated by edema of the retro-orbital fat (arrow in B). The source of the infection is dental caries in the last upper molar (arrow in D) associated to periapical abscess that causes bone erosion of the maxillary sinus floor (arrow in C). The patient received aggressive intravenous antibiotic therapy with complete remissation of the symptoms. A week later tooth extraction was performed.

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**Fig. 8:** A 65 year-old patient with poorly controlled diabetes and 4-day history of upper airway infection that was being treated with paracetamol by his general physician. Two days later presents at the emergency room with high fever, sinusitis, mild proptosis and facial hypoesthesia. Acute invasive fungal sinusitis and mucormycosis. Axial contrast-enhanced CT image shows opacification of right maxilar sinus with obliteration of the masticator space fat (arrow in A). Coronal image shows post septal orbital cellulitis with enlargement of the inferior rectus muscle (arrow in B).

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Fig. 9: Same patient received prompt and aggressive antibiotic therapy and immediate surgical debridement. Acute invasive fungal sinusitis with orbital and anterior cranial fossa invasion. A. Coronal contrast-enhanced CT images with soft tissue and bone window settings, show bone destruction at the level of lamina cribosa with a small epidural abscess (arrows). B. Coronal and axial contrast-enhanced CT images show postsurgical changes at the right nasal fossa and maxilar sinus (asterisk). Myositis of the inferior rectus muscle with a small sub periosteal abscess are also seen (arrows). Finally the patient became severely ill and died, despite the intensive care and aggressive antibiotic therapy that received.

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Fig. 10: A 74 year-old patient presenting with high volume nose bleeding with haemoglobin 10 g/dl. He had history of recidivant epistaxis treated with nose compression. Idiopathic massive epistaxis with right posterior nasal pack. Axial contrast-enhanced image shows a Foley catheter occluding the coanal arc (arrow). At fibroscopy right posterior epistaxis from the left sphenopalatine artery was found and treated with electrocoagulation.

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**Fig. 11:** Coronal and axial graphic show important structures of right temporal bone.

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Fig. 12: A 13 month-old patient with acute otitis media that was being treated with oral antibiotics by her physician. After a few days the patient presents to the emergency room with high fever and important left retro auricular swelling and pain. Acute suppurative otitis media with sub periosteal abscess. A. Coronal CT image with bone window settings show complete opacification of both middle ear and mastoid cells with no bone erosion. Soft tissue material into the left external auditory canal, indicates suppurative otitis media. The arrow shows right normal tympanic membrane. B. Axial CT image with brain window settings show temporal soft tissue swelling with small subperiosteal abscess (arrow). The patient received intravenous antibiotic therapy with complete recovery.

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Fig. 13: 3 year-old child who presented with seizures and unresponsiveness. He had been treated with Amoxicillin for two weeks for left otitis. Bilateral acute otomastoiditis with brain and epidural abscess. Contrast-enhanced temporal bone CT scan (A) demonstrates opacification of the left tympanic and both mastoid cavities without cortical bone erosion. The contrast-enhanced head CT scan (B) and contrast-enhanced brain MRI (C), show a left temporal brain abscess (white arrows) with ring enhancement and surrounding vasogenic edema. Note the pathologic enhancement of both mastoid cavities (red arrows in C) and a small laminar epidural abscess (white short arrow in C). The patient received aggressive wide-spectrum antibiotic therapy, with progressive recovery.

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**Fig. 14:** A 13 month-old patient with 3-day history of fever with sudden bilateral facial swelling. Acute infectious sialadenitis. Ultrasonography images with high-frequency probe show an enlarged, rounded parotid glands with an heterogeneous echo structure and hypervascularized at color Doppler US. Asterisks show enlarged hypoechoic lymph nodes within the gland (red asterisk) and periglandular (white asterisk). The patient received symptomatic therapy with progressive recovery.

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Fig. 15: A 16 year-old boy with repetitive sialadenitis presents with facial pain exacerbated by eating that did not improve with conservative management. Sialolithiasis. Contrast-enhanced axial CT image obtained with soft tissue (A) and bone (B) window settings, show a large calculi inside the distal part of a dilated Stenon duct. The patient undergone surgical extraction of the syalolith.

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Fig. 16: A 69 year-old woman with 3-day history of unilateral facial pain that was being self-treated with ibuprofen, presents to the emergency room with important swelling and fever. Acute suppurative parotiditis. Axial contrast-enhanced CT image shows enlargement of the right parotid gland with a large area of low attenuation (asterisk) with peripheral rim-like enhancement, a finding indicative of intraparotid abscess. The patient received intravenous antibiotic therapy and surgical drainage of the fluid collection was performed.

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**Fig. 17**: Graphic of skull base from below shows spaces of suprahoid neck relationships to skull base.

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Fig. 18: Axial graphic of the suprahoid neck spaces at the level of the floor of the mouth.

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Fig. 19: Axial graphic depicting the spaces of the suprahoid neck.

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Fig. 20: Axial graphic depicting the fascia and spaces of the infrahyoid neck.

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Fig. 21: 50 year-old patient presents with fever, facial swelling and a lump on the floor of the mouth. He had history of poor dental hygiene. Oral cavity phlegmon. Axial contrast-enhanced CT images with soft tissue and bone window settings, show a phlegmon on the floor of the mouth (asterisk), secondary to a right mandibular molar periapical abscess with dehiscence of the lingual wall (arrow). The patient received intravenous antibiotic therapy with full recovery. Two weeks later tooth extraction was performed.

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Fig. 22: 80 year-old patient with 3-day history of odontalgia and facial swelling. Buccal space abscess. Axial contrast-enhanced CT images with soft tissue and bone window settings, show a fluid collection with rim-like enhancement in the left buccal space (asterisk). The bone window image shows the source of the infection, a periapical cyst (arrow). The patient received intravenous antibiotic therapy with progressive recovery. Surgical drainage was not needed. A week later tooth extraction was performed.

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A 18 year-old previously healthy woman with odynophagia and fever was being treated as a common sore throat by her general physician. After 4 days presents to the emergency room with high fever and difficulty in swallowing solid food and liquids. Descending necrotizing mediastinitis caused by parapharyngeal space abscess. In A, axial and coronal contrast-enhanced CT images show an hypodense fluid collection extending from the parapharyngeal space to the hypofarynx and supraglotis (arrows). After five days of intravenous antibiotic therapy the patient develops dyspnea and intense retrosternal pain. A cervicothoracic contrast-enhanced CT scanner was performed. B and C show extensive air and fluid collections throughout the deep soft tissues of the neck extending to the mediastinum with a fluid collection with rim-like enhancement in the right paracardiac space (arrows). The patient received aggressive antibiotic therapy at the intense care unit with progressive recovery. Surgical drainage of the mediastinal collection was performed.
Fig. 24: A 9 year-old boy with history of sore throat that was initially treated by his paediatrician with ibuprofen. 4 days later the patient starts high fever and impossibility to swallow solids and liquids. Right peritonsillar abscess. Axial and coronal contrast-enhanced CT images demonstrate a peripherally enhancing fluid collection in the right peritonsillar region (asterisks). Note the mass effect on the oropharynx. The patient received appropriate antibiotic treatment and surgical drainage was performed with promptly recovery.

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Fig. 25: A 58 year-old patient with intense odynophagia, fever and cutaneous rash with palmoplantar involvement. A week before the onset of the symptoms, the patient drank contaminated water from a lake in a zone with high prevalence of zoonotic diseases. Ganglionic tularemia. Axial and sagittal contrast-enhanced CT images show bulky left necrotic lymphadenopathy (arrows). The diagnosis was confirmed by antibody detection for F. tularensis and the patient received appropriate antibiotic treatment.

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Fig. 26: A 16 year-old Latin-American girl presents with a painless left cervical mass. The patient is HIV negative with positive Mantoux test, and personal history of no interest. Tuberculous lymphadenopathy (scrofula). A-B Axial and coronal contrast enhanced CT images shows necrotic lymph nodes in the periparotid region and Iia -b levels (arrows). C. Axial contrast-enhanced CT image shows partially calcified subcarinal lymphadenopathy suggesting healed pulmonary tuberculosis. The biopsy showed granulomatous lymphadenitis with caseous necrosis consistent with tuberculosis.

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Fig. 27: 86 year-old patient with 5-day history of dysphagia and odynophagia that was initially treated with analgesics by his general physician. 3 days later starts with high fever and abnormal mental status. Retropharyngeal abscess. Axial contrast-enhanced CT image shows a retropharyngeal fluid collection (asterisk) with peripheral rim-like enhancement. The abscess was caused by the ingestion of a fishbone. The patient received appropriate antibiotic therapy and surgical drainage was performed.

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Fig. 28: A 88 year-old patient presents with fever and decreased conscious level. She had 5-day history of odynophagia and cough that was being treated as a common sore throat by her general physician. Parapharyngeal abscess with extension to the hypopharynx and larynx. Axial and coronal contrast-enhanced CT images show a fluid collection in the right parapharyngeal space (arrow in A) extending to the retropharyngeal and paraglotic space, pyriform sinus and carotid space. The abscess descends to the glottis. Arrow in B shows enlarged, oedematous epiglottis with mild narrowing of the airway. Arrows in C show the extension of the fluid collection. The patient received intravenous antibiotic therapy and surgical drainage was performed.

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**Fig. 29:** A 79 year-old patient under anticoagulation therapy presenting with acute dyspnea after minor facial trauma. Prevertebral hematoma. Axial (A), coronal (B) and sagittal (C) contrast-enhanced CT images show a large prevertebral hyper dense hematoma with complete obstruction of the airway. The patient underwent tracheostomy (white arrow in B). The patient was intubated and managed at the intense care unit with conservative therapy with progressive recovery.

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Fig. 30: Severely ill patient with urologic sepsis with sudden onset of cervical pain and fever despite the intravenous antibiotic therapy. Septic spondylodiskitis secondary to haematogenous spread of S. aureus. Sagittal T2 (A), sagittal T1 (B) and sagittal post gadolinium-enhanced (C) MRI images show heterogeneous abnormal signal of C3-C6 vertebral bodies and disk spaces, indicating diskitis. The arrow in C shows extension of the infection into the ventral epidural space. At blood culture grew S. aureus. The patient received appropriate antibiotic therapy and intense care with progressive and complete recovery. Surgical drainage was not needed.

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**Fig. 31**: A 45 year-old man with history of chronic alcohol abuse and 5-day history of sore throat and fever, was taking paracetamol as self-treatment. 4 days later the symptoms worsen and on arrival to the emergency room the patient was unconscious. Lemierre syndrome. Axial contrast-enhanced CT images show a right peritonsillar phlegmon with small abscess (arrow in A). B and C show expansion of the right common facial vein vein by a thrombus (arrows in B) with extension into the internal jugular vein (arrow in C). Venous wall enhancement and surrounding inflammation also are seen. Axial CT image obtained at the level of the lung apex with lung window settings (D), shows pulmonary bilateral nodules (arrows) indicating septic emboli.

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Fig. 32: Same patient of the previous case who became severely ill with multi-organic septic failure, impairment of ocular movements and persistent mydriasis of the right eye. Cultures of blood drawn at admission grew Gram-negative bacilli (Fusobacterium). Evolution of Lemierre syndrome. Axial CT image at the level of pulmonary apex (A) shows right pleural effusion, left pneumothorax (arrow) and pulmonary nodules with areas of cavitation. Brain MR: Axial FFE-T1 contrast-enhanced images (B and C) show abnormal dural enhancement, small epidural abscess (arrow in B) and a rim-enhanced mass indicating metastatic cerebral abscess (arrow in C). The patient received appropriate treatment and intensive care with progressive recovery.

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Fig. 33: Ingestion and aspiration of foreign bodies in three different patients. A. A 4 year-old patient with fever, sialorrea and torticollis. Lateral neck radiograph shows a radiopaque foreign body (staples) posterior to the larynx, within the upper esophagus. A therapeutic fibroscopy was performed. B. A 2 year-old patient presenting with complete dysphagia and sialorrea. Esophagogram with hydro soluble contrast show complete obstruction of the upper esophagus by a radiolucent foreign body (arrow). A diagnostic and therapeutic fibroscopy was performed obtaining an organic foreign body (seed). C. A 10 year-old asymptomatic patient with congenital CMV infection. Metallic foreign body (coin) was incidentally found within the left nasal fossa on a brain CT scanner performed for another reason. A therapeutic fibroscopy was performed.

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Fig. 34: A 40 year-old patient presenting with dyspnoea and hard swelling at the lower central neck region that suddenly appeared after exertion (weightlifting). Spontaneous thyroid hematoma secondary to massive hemorrhage into a thyroid nodule. Axial non-contrast (A) and coronal contrast-enhanced (B) CT images show about 6 x 5 cm heterogeneous mass in the right thyroid lobe compressing and displacing the trachea. Arrow in A shows a small calcification of the nodule. Note the areas of high attenuation due to hemorrhage. The patient received high doses of corticoids and airway was closely monitored. A partial thyroidectomy was performed 2 weeks later.

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Conclusion

There are several conditions that affect the neck and head as an emergency, most of them resulting in significant suffering, functional impairment, even death if not promptly diagnosed and treated. The anatomy of the head and neck is complex, so a thorough evaluation with an adequate technique is always needed, usually with CT in the emergent setting. MRI and US play an important secondary role.

The resident and general radiologist must be capable to recognize common diseases affecting these parts of the body and be familiar with those not so common conditions that rapidly endanger the patient health. Awareness of these conditions is important to provide an accurate diagnosis, evaluate for potential complications and facilitate adequate treatment.

The clinical setting is extremely valuable to refine the study protocol and narrow the diagnostic suspicion.
References