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Nontraumatic head and neck emergencies: A clinical approach. Part 1: Cervicofacial swelling, dysphagia, and dyspnea☆

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Abstract Nontraumatic emergencies of the head and neck represent a challenge in the field of neuroradiology for two reasons: first, they affect an area where the thorax joins the cranial cavity and can thus compromise both structures; second, they are uncommon, so they are not well known.

Various publications focus on nontraumatic emergencies of the head and neck from the viewpoints of anatomic location or of particular diseases. However, these are not the most helpful viewpoints for dealing with patients in the emergency department, who present with particular signs and symptoms.

We propose an analysis starting from the four most common clinical presentations of patients who come to the emergency department for nontraumatic head and neck emergencies: cervical swelling, dysphagia, dyspnea, and loss of vision. Starting from these entities, we develop an approach to the radiologic management and diagnosis of these patients.

PALABRAS CLAVE
Lesiones del cuello;
Enfermedades orbitarias;
Enfermedades de los senos paranasales;
Sialadenitis;

Urgencias no traumáticas de cabeza y cuello. Aproximación desde la clínica. Parte 1: tumefacción cervicofacial, disfagia y disnea

Resumen Las urgencias no traumáticas de cabeza y cuello son un reto en el campo neurorradiológico por dos motivos: *a*) su área de afectación está en la encrucijada del tórax y la cavidad craneal y puede comprometer ambas estructuras y *b*) su baja incidencia en la urgencia, lo que supone que sean poco conocidas.

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Celulitis;
Diagnóstico por imagen;
Rayos-X;
Tomografía computarizada;
Resonancia magnética

En las diferentes publicaciones se realiza un enfoque de este grupo nosológico desde la localización anatómica o desde la patología en concreto. Sin embargo, los pacientes cuando acuden al servicio de urgencias no lo hacen desde este aspecto, sino con unos signos y síntomas clínicos concretos.

Proponemos un análisis a partir de las cuatro formas clínicas más frecuentes por las que acuden los pacientes al servicio de urgencias: tumefacción cervical, disfagia, disnea y déficit visual. A partir de estas entidades desarrollamos una forma de manejo radiológico y un método para su diagnóstico.

Introduction

Non-traumatic head and neck emergencies represent a small group in radiological work and yet, they are very important. As Brucker et al.[1] point out, this anatomical region has few structures that can be dispensable and therefore, it is especially sensitive to inflammation and infection. Its location, halfway between general radiology and neuroradiology, causes them to be little known and handled inadequately. They are usually structured depending on the anatomical region involved in the pathological process. However, when patients come to an emergency service they do not report an anatomical segment, even though it can be inferred in most cases, but rather certain clinical symptoms and signs. In the neck and head area, the main complaints can be grouped into four main categories: cervicofacial swelling, dysphagia, dyspnea and acute sensory deficit and they can occur in isolation or in combination. In this review, we have developed a form of radiological management (imaging modality of choice and study protocol that is to be followed) and a diagnostic method (reading guidelines, considering the findings that are of interest for the clinician and final diagnosis).

Evidently there are more clinical manifestations than the ones referred to in this update, but we have chosen those that we must know as well as others that are less common but with such a such characteristic radiological image that they can be representative of diagnostic success.

Nosologic unit and imaging modalities

There are four clinical situations in non-traumatic head and neck emergencies: cervical swelling, dysphagia, dyspnea and sensory deficit (Fig. 1). The causes responsible for these manifestations can be of inflammatory-infectious, tumoral or vascular origin.[2] In this first part, we will discuss cervical swelling, dysphagia and dyspnea that can occur in isolation or combination. In the second part on neck and head emergencies, we will refer to the clinical manifestations associated with facial swelling, dysphagia and dyspnea, and the emergencies related with sensory deficit.

Cervical swelling is the inflammatory condition (''tumefaction'') associated or not with pain and/or fever. It can be diffuse, and affect the entire neck, involve the anterior facial (or more precisely be periorbital or perisinusal) region or it can be located in the periauricular region. The imaging modality of choice in this situation is computed tomography (CT) performed after the administration of IV contrast, whose spread is variable. If located in the periorbital or perisinusal regions, the examination is limited to these anatomical areas. If diffuse or periauricular, the study protocol must go further from the hearing duct and into the cervicothoracic junction. When there are findings on this test or the patient shows clinical signs or symptoms suspicious of an intracranial condition, it will be necessary to widen the study to the cranial region by performing a CT and/or a magnetic resonance imaging (MRI) in a complementary manner. A simple X-ray, though not commonly used, continues to be indicated as the initial test in cases of cervical pain that are not associated with inflammatory signs[3] (Fig. 2).

Dysphagia and dyspnea are clinical manifestations that can occur in isolation or associated. The abrupt occurrence of dysphagia and/or dyspnea, especially in children and elderly people, can arouse suspicions of the presence of foreign objects. In these cases, performing a simple X-ray can be enough to establish diagnosis (Fig. 2B). It is also enough to perform an X-ray when these manifestations occur in children, are associated with fever symptoms, and the physician is suspicious of epiglottitis. In this context, fiberscope examination can be difficult (due to risk of laryngeal edema) and CT should be avoided because it presupposes a large radiation dose (Fig. 2c). In adult individuals, the study of dysphagia and dyspnea should be performed with a CT that includes the entire cervical region, with or without IV contrast.

Cervical-facial swelling

Orbital

Orbital cellulitis

Orbital cellulitis is inflammation of orbital fat. Most manifestations are limited to soft periorbital tissues due to the presence of the natural barrier of the orbital septum. This fibrous membrane cannot be seen on image tests, but it can be imagined as a line connecting the borders of the orbit and the anterior region of the bulbus oculi. Inflammatory processes anterior to the septum are called preseptal cellulitis, and those spreading posteriorly–postseptal cellulitis.[1]

Preseptal cellulitis is due to a skin or eyelid inflammation secondary to an infection. From the clinical point of view

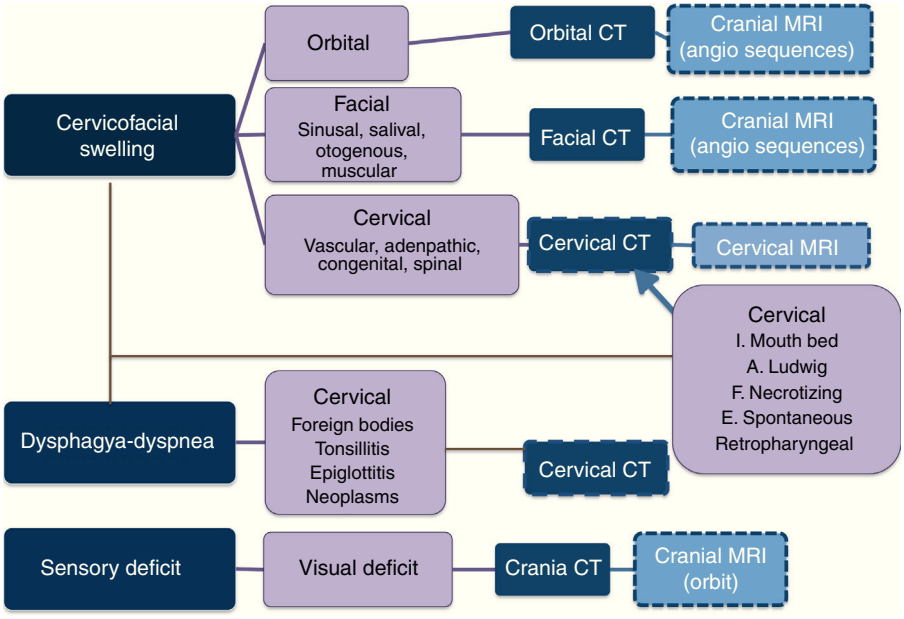

Figure 1 Diagram of the different clinical manifestations, the area affected and the imaging modality.

there is unilateral condition with pain, swelling and eyelid erythema. Clinical manifestations are easy to recognize by the ophthalmologist and they do not require any imaging modalities.

Postseptal cellulitis is usually secondary to ethmoiditis accessing the orbit through the foramina or the small bone fenestrations. It is also unilateral, and the signs described in the preseptal forms are associated with chemosis, visual acuity reduction, eye movement restriction and exophthalmia, signs that cause the clinician to suspect a posterior condition. In view of these clinical manifestations, CT allows us to define the different clinicoradiological

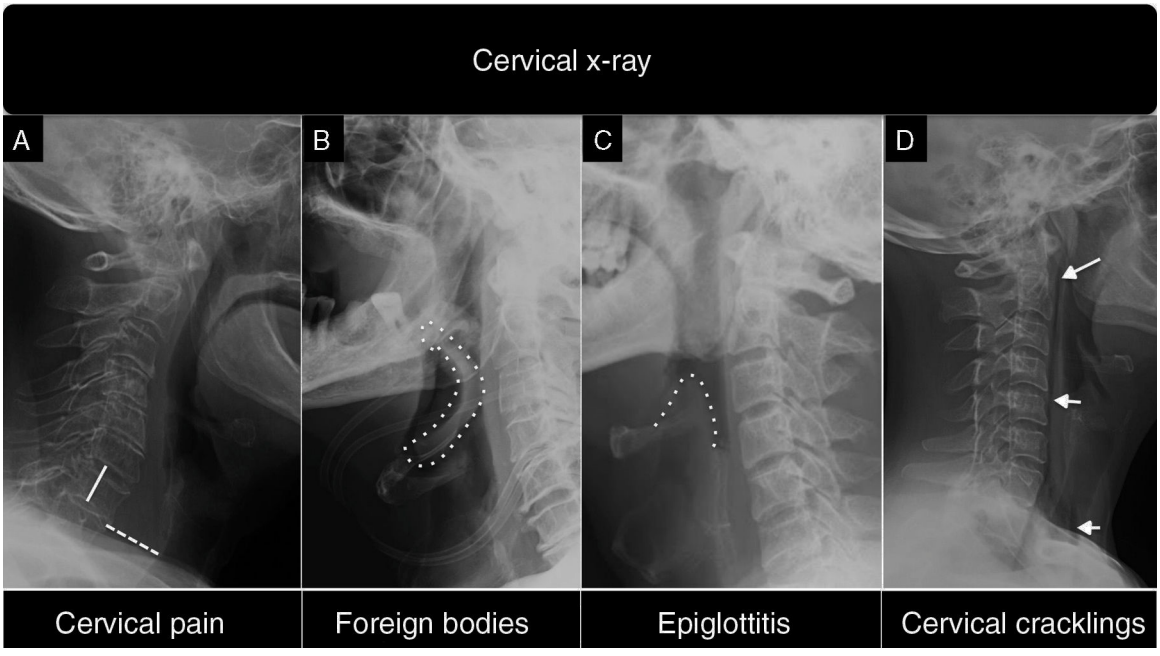

Figure 2 Indications of a simple X-ray. (A) Patient at admission presenting with cervical pain. There is an increase of prevertebral soft parts. The prevertebral diameter – dotted line – is greater than the height of the vertebral body – continuous line. This led to indicating a cervical MRI where it was possible to see an abscess secondary to spondylodiscitis. (B) Patient with dementia who abruptly refers dysphagia. The X-ray revealed the presence of a foreign body: ''his dentures'' (dotted line). (C) 18-month-old child with epiglottitis. The ''thumb'' image characteristic of this process can be observed (dotted line). (D) Young woman presenting with dyspnea and dysphagia of abrupt occurrence; cervical cracklings in clinical examination. Findings were secondary to spontaneous cervical emphysema (arrows).

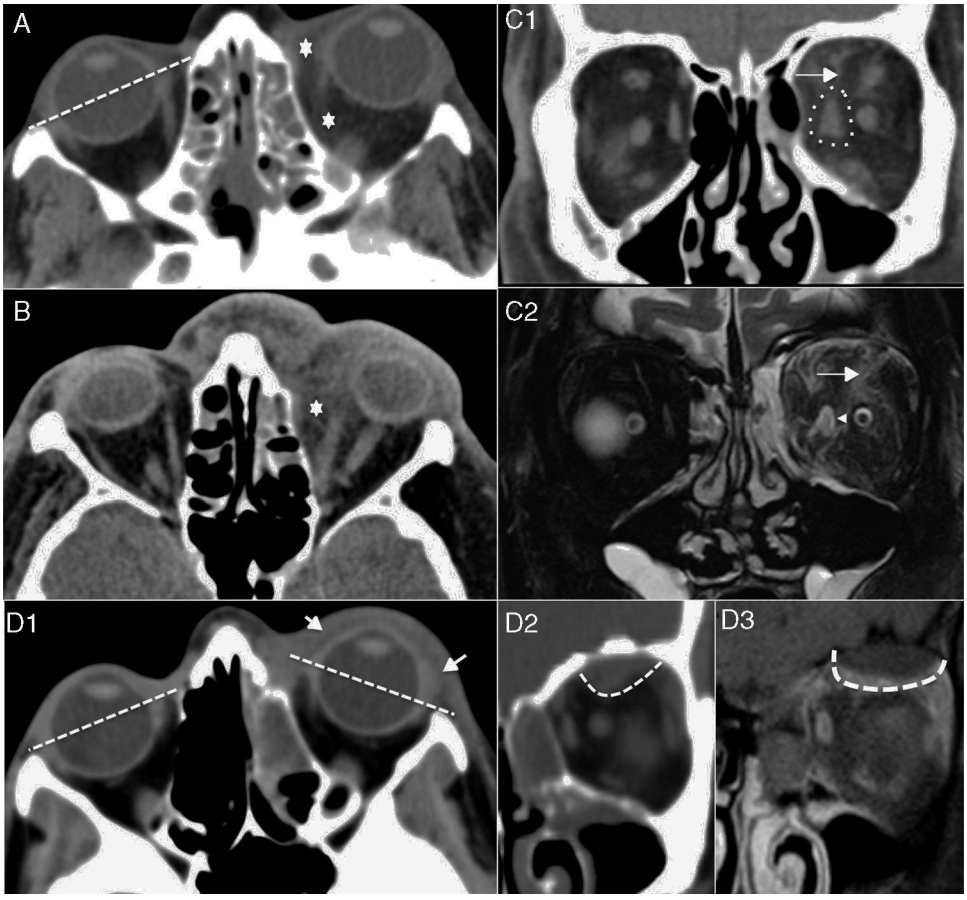

Figure 3 Retroseptal orbital cellulitis. (A and B) Axial computed tomography (CT). Two phases of a progressive condition. There is an increase of preseptal and retroseptal fat density (asterisk) associated with mild proptosis. The separation of the septal and retroseptal regions has been indicated in the contralateral orbit (dotted line). (C1) Coronal CT. There is a greater retroseptal affectation than in A and B. Small liquid linear collections (arrow) and increase in the caliber of medial rectus muscle (dotted ellipsis). (C2) T2-weighted MRI coronal section with fat saturation at the same level as C1. The collections (arrow) and the myositis (arrowhead) can be seen more clearly. (D1) Axial CT of another patient who presented with clinical manifestations of cellulitis associated with proptosis and eye movement limitation. The axial CT only showed an increase of fat density at the preseptal level (arrows). (D2) Coronal CT. The coronal reconstruction allowed us to objectify the presence of a subperiosteal abscess on the orbital roof (dotted line). (D3) T1-weighted MRI coronal section with fat saturation and gadolinium. The intraorbital affectation was observed more clearly on the MRI than on the CT.

stages (Fig. 3). At the beginning there is a trabeculation of the intraorbital fat, which represents a combination of edema, vascular congestion, increase of patency and inflammatory infiltrates. When the infection progresses, trabeculation becomes more prominent and it can cause the intraorbital mass effect. In more advanced phases, subperiosteal abscesses occur, as well as myositis of extrinsic musculature, orbital abscesses and thrombophlebitis.[4,5] Subperiosteal abscesses, though mainly observed in the medial orbital region, can also be located in the orbital roof so it is necessary to assess CT with coronal reconstructions (Fig. 3D). MRI is used complementarily to the CT. It is performed when it is necessary to establish the degree of orbital impairment (clinical discrepancy with CT findings) and when the lateral edge of the cavernous sinus is convex or there is no contrast dying of it, to confirm or rule out its possible thrombosis.

Non infectious orbital inflammatory disease

In this section, we find those processes that cause acute orbital inflammation, generally associated with pain in which there is no infectious etiology. The main representative of this entity is the idiopathic inflammatory syndrome or orbital pseudotumor, but there are also systemic diseases such as Wegener's granulomatosis, lupus, Sjögren syndrome or rheumatoid arthritis, that can occur in a similar manner. From the radiological point of view, they appear as infiltrating orbital masses that can be diffuse, and involve the entire orbit, or even be focal. Focal forms can affect the anterior or posterior region of the bulbus oculi, the extrinsic musculature, the lacrimal gland or the orbital apex (the latter could be the entity responsible for a Tolosa–Hunt syndrome). Diffuse or focal in form, in most cases the condition is usually unilateral and it characteristically goes back with corticoid treatment.

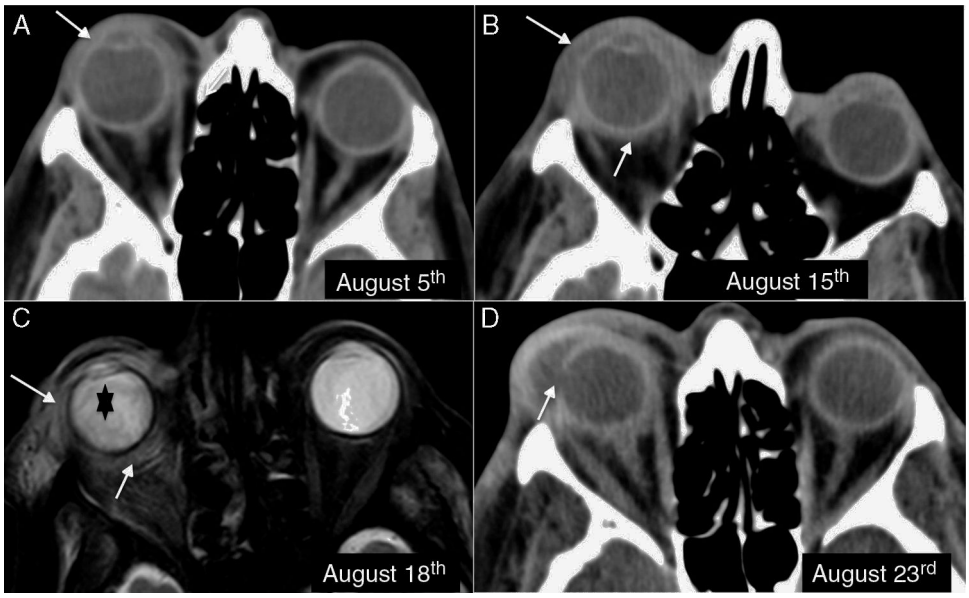

Figure 4 Scleritis with posterior development of endophthalmitis. (A, B and D) Axial computed tomography of the orbits. (C) T2-weighted MRI axial section with fat saturation. Diabetic patient who the 5th day presented with pain, proptosis and right eye redness. There is an increase of preseptal soft parts (arrow in A) interpreted as orbital pseudotumor. Corticoid and antibiotic treatment is started, but the condition progresses clearly observing greater affectation of the bulbus covers (arrows in B) an even inflammatory affectation of the intra- and extraconal fat (arrows in C). Also there is an unreported loss of the right vitreous signal (asterisk in C). Finally, the progression of the process led to the development of a peribulbar abscess (arrow in D). Diagnosis after the microbiological study was endogenous or metastatic endophthalmitis secondary to *Escherichia coli*.

Endophtalmitis

The ophthalmologist studies the inflammatory-infectious condition of the coats of the eye with the clinical assessment and, sometimes with ultrasound. However, when associated with visual alterations or pain, the clinician can indicate a CT or an MRI. Endophthalmitis is an uncommon secondary complication that must be born in mind in this situation. In those cases where we can radiologically see an inflammatory condition of the coats of the eyes that makes us consider the focal forms of inflammatory pseudotumor, we must check the medical history. Persistent pain and inflammation and failure to respond to corticoids are data that can help us establish proper diagnosis and avoid a mistake that can be fatal (Fig. 4).

Facial

The cellulitis and facial fasciitis that occur as a result of skin adnexa are usually focal and do not require any imaging modalities. However, persisting-relapsing or more extensive cases are characterized only incompletely with clinical examination and they require CT. The correct radiological interpretation of the findings requires knowing the patients' surgical history and medical treatment.

Factitial panniculitis is a granulomatous inflammatory disease with foreign-body giant cells. It is an entity different from other ''true panniculitis-fasciitis'' manifestations that are described in eosinophilic fasciitis, lupus, scleroderma, paraneoplastic syndromes and other vasculitis and connective tissue diseases. Factitial panniculitis has been described in dermatological literature in relation with silicone injections, Chinese cupping therapies and acupuncture. Today, when esthetics is so important, the use of multiple types of injections and facial treatments on the facial region is very common that can act as antigens and activate inflammatory responses. From the radiological point of view, silicone is viewed as an increase of pseudonodular density in the subcutaneous face tissue, generally in the canine fossa (Fig. 5A).

Angioneurotic edema is a transitory swelling that can affect any parts of the body.[6–8] Angiotensin-converting enzyme inhibitors (ACEI) are the most common cause of this entity; responsible for up to 35 per cent of the cases, but other drugs have been discovered, as well as allergic etiologies and hereditary disorders. The pathogenesis of the process is the overproduction or failure in the inactivation of vasoactive agents, which leads to vasodilatation, increase in patency and occurrence of edema. When it is bilateral and has a cervical-facial location, which affects the skin and the subcutaneous cellular tissue, its diagnosis can be established, especially if there is previous history of ACEI intake (Fig. 5B). However, its diagnosis can be delayed or not be made in focal and asymmetric forms or with exclusive affectation of the aero-digestive ways (Fig. 5C and D), and in patients without pharmacological history. As radiologists we must know this short-lived episodic entity

Sinusal

Rhinosinusitis is a public health problem that affects 12–16 per cent of the US population.[9] The most common cause of acute sinusitis is viral infection of the upper respiratory tract and it can remit in 10 days. However, mucosa

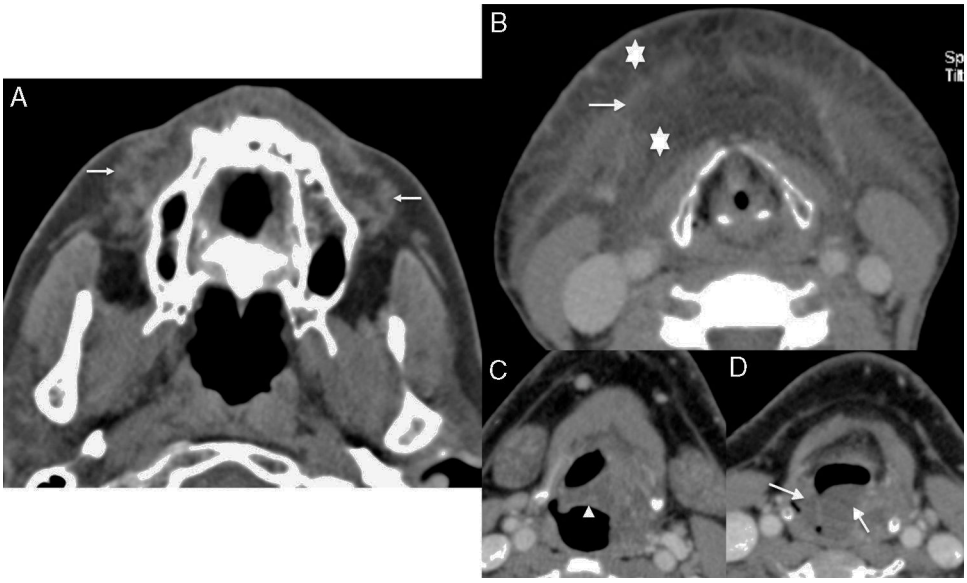

Figure 5 Facial swelling. (A) Computed tomography (CT), axial section. There is alteration in density of the canine fossa fat (arrows) with presence of pseudonodular images. The patient went to the emergency room three times due to facial swelling. The biopsy revealed findings compatible with factitial fasciitis. (B) Axial section CT with IV contrast. There is a marked increase of fat density and stringiness in the subcutaneous cellular tissue (*) and thickening of the *platisma coli muscle* (arrow) in this case of angioneurotic edema secondary to taking Angiotensin-converting enzyme inhibitors (ACEI). C and D) Axial section CT, with IV contrast at different levels of the aero-digestive way. There is thickening of the epiglottis (arrowhead) and ari-epiglottal folds (long arrows) due to edema secondary to taking AECIs.

congestion and blockage of secondary exit *ostia* can predispose the development of a secondary bacterial infection. When this happens, it is solved in most of the cases with antibiotic treatment and nasal decongestants, but one third of the patients can become chronic or have complications. They have been classically grouped into two categories: orbital and intracranial. Orbital sinusitis occurs more frequently due to ethmoid condition according to the different stages of retroseptal cellulitis described. Intracranial ones are uncommon and when they occur, they are usually the consequence of a frontal sinusitis, especially in children. Due to venous communication between the frontal bone and the dural venous sinuses it should never be forgotten that an undiagnosed or poorly treated frontal sinusitis can lead to extracerebral empyema, meningitis and intraparenchymatous abscesses without necessarily the destruction of the bone (Fig. 6A–C). The development of subperiosteal abscesses is less common – the so-called Pott's puffy tumors[10,11] that appear as a frontal swelling secondary to osteomyelitis of the frontal bone (Fig. 6D–F). The imaging modality of choice to study these complications is the MRI.[12–14]

Fungi are a less common etiology of sinus infection.[15,16] Fungal sinusitis is classified into two groups, invasive and non-invasive, depending on whether or not there is histopathologic evidence of tissue invasion by the fungus.[17] Invasive forms can be acute or chronic. Acute forms occur in immunodepressed patients and they occur clinically with fever, headache, rhinorrhea and facial pain. Nasal condition is common in these cases, above all at the level of the middle turbinates leading to the description of black-turbinate sign or hypo-uptake turbinate in T1 images with gadolinium (Fig. 6G–I). Tissue necrosis secondary to the angioinvasive character of the fungus[18] is responsible for segmentary hypo-uptake that stands out over the hyper-uptake normal nasal mucosa. Other radiological signs characteristic of this entity are hyper-attenuated areas in opacified sinuses, in CT examinations without contrast, and intrasinus hyposignal focuses on the MRI in T2-weighted images, secondary to fungal concretions. These aggressive forms of sinus infection urge us to study the cranial cavity to assess the existence of more ominous complications (Fig. 6I).

Chronic invasive forms occur in a more indolent manner, with chronic sinusitis symptoms in most cases. But their invasive character can lead to an orbital apex syndrome, with reduction of visual acuity and ocular motility, if the fungus reaches the fat in this region.

Otogenous

Acute otitis media is the most common infectious process in the first years of life. Its clinical course is brief, but a small proportion of patients can have complications. After the affectation of the chamber, the infection can spread and cause acute mastoiditis due to affectation of the mastoid trabecular bone. The manifestations can remit or continue by blocking the aditus and progress to the demineralization and osteonecrosis of mastoid wall causing purulent cavities, or coalescent mastoiditis – situation requiring urgent mastoidectomy.[19] From the radiological point of view, there is loss of osseous septa that is assessed by comparing with the number, thickness and mineralization of the mastoid intercellular trabeculae on the contralateral side. Progression of the disease, more common in adults, due to the fact

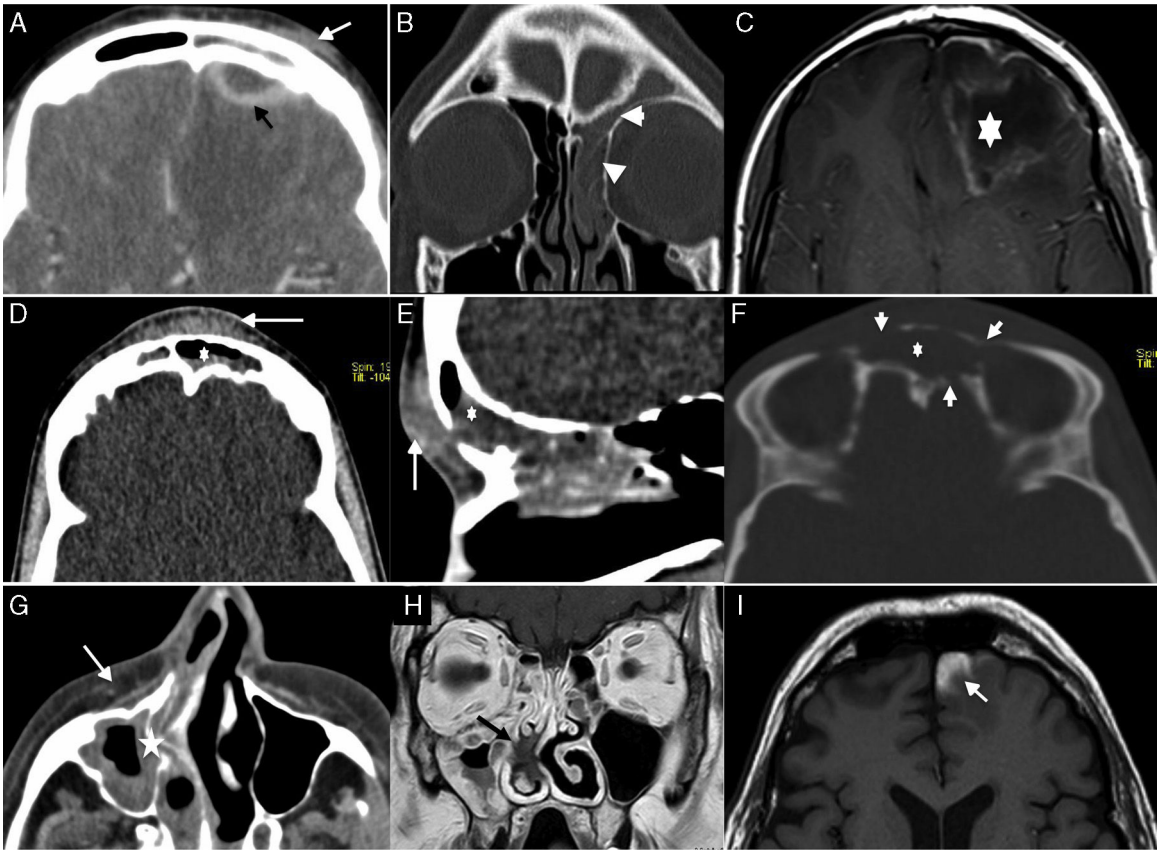

Figure 6 Complications of sinusitis. (A) Computed tomography (CT), axial section with IV contrast. (B) CT, coronal section. (C) T1-weighted axial MRI section with gadolinium. This is a patient who had showed up at admission 2 weeks before with periorbital edema diagnosed and treated outpatiently as preseptal cellulitis without performing any imaging modalities. She comes again due to an increase of periorbital edema and headache. CT is indicated (A, B) due to suspicion of retroseptal cellulitis. The patient had frontoethmoidal sinusitis (arrowheads in B) with periorbital edema (white arrow in A) and an empyema (black arrow in A) and an intraparenchymatous abscess (asterisk in C) at the intracranial level. D) CT, axial section. (E) CT, sagittal section. (F) CT, axial section (window of bone). (D–F) This is a patient who after reporting symptoms of sinusitis the week before comes to the hospital due to frontal swelling. The existence of frontal sinusitis is confirmed (asterisk in D, E and F) with alteration and fragmentation of the frontal bone due to osteomyelitis (short arrows in F) and Puffy Pott's tumor (long arrows in D and E). (G) CT, axial section. (H) T1-weighted MRI coronal section with gadolinium. (I) T1-weighted MRI axial section. (G–I) Images of a patient under treatment for acute leukemia with pain and facial swelling. The first image showed right nasal-sinus occupation (star in G) with swelling of soft facial parts (arrows in G). The MRI with contrast showed normal nasal mucosa enhancement except for the area of the nasal crest where there was a lack of enhancement secondary to necrosis (equivalent to black-turbinate sign) (black arrow in H). Also there were areas of ischemia and hemorrhage in the frontal lobe parenchyma (white arrow in I). The patient died four days later due to a fulminating acute sinusitis secondary to *Aspergillus*.

that their mastoids are aerated and therefore osseous walls are thin, can spread through the medial or lateral cortex of the mastoid apophysis. Medial spread progresses through the deep cervical spaces and causes what is called Bezold's abscess.[20,21] This spread is not usually palpable clinically and therefore it is the radiologist who usually establishes its diagnosis. Progression toward the external cortex leads to the formation of subperiosteal abscesses. Spread beyond these regions can cause intracranial complications such as sinus thrombosis and abscesses. These processes sometimes occur on a stage after the acute outbreak of the disease (latent or masked mastoiditis) and even with an aerated cavity of the middle ear. We must not forget either that just as described in frontal sinusitis, these complications can occur without the need for rupture of the osseous cortex (Fig. 7).

Salival

Swelling of salivary glands or sialoadenitis usually has viral or bacterial etiology. The viral one is more commonly bilateral and parotid. The bacterial one is caused due to complications of other processes. Lithiasis is observed in 80–90 per cent of submandibular locations and in 10–20 per cent of the parotid ones.[22,23] Dehydration, advanced age and a debilitated condition are the most common factors that trigger parotid gland suppurative sialoadenitis. Clinically, the patients show poor general condition, fever and unilateral facial swelling. On the radiological tests there is a poorly defined gland that is increased in size, with dilation and enhancement of the salivary duct and sometimes presence of low-density collections indicative of abscess formation (Fig. 8).[1,21,22]

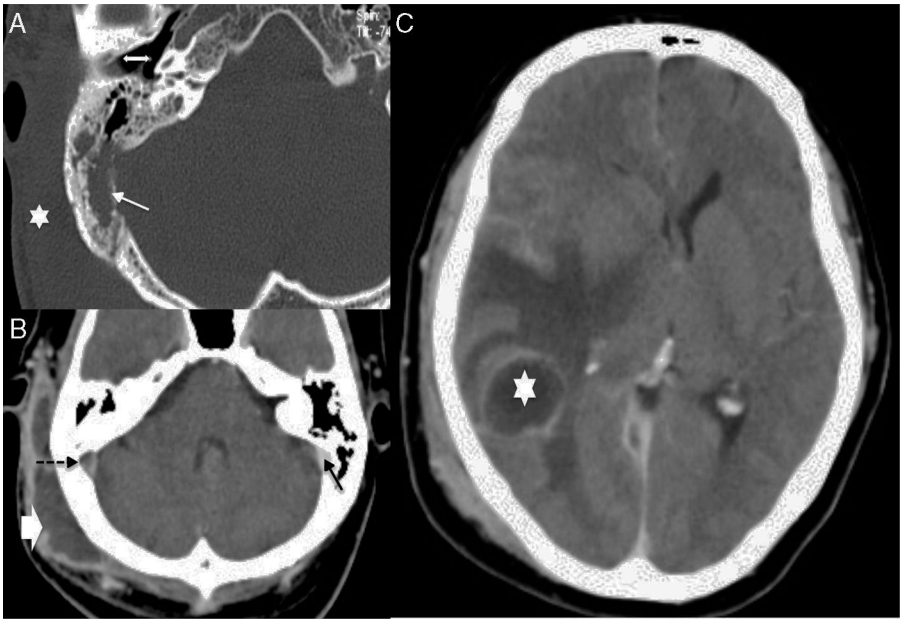

Figure 7 Complications of otitis. (A) Computed tomography (CT), axial section in bone window. Patient with auricular swelling (*) in A, secondary to *coalescent mastoiditis* (arrow in A). A month before he had suffered from acute otitis. At the moment of the study the eardrum was well aerated (double arrow in A). (B) CT, axial section with IV contrast. (C) CT, cranial axial section with IV contrast. This is an immunodepressed patient who presented a *subperiosteal abscess* (white arrow in (B) and intracranial complications. The *thrombosis of the lateral* sinus was diagnosed through absence of contrast filling of the sinus (black dotted line in B) – observe comparatively with a normal filling of a healthy side (black continuous arrow in B) – and a *cerebral abscess* (white asterisk in C).

Muscular

Myositis or muscle inflammation is an uncommon cause of facial swelling (Fig. 9).

In most cases, it is of bacterial origin and it generally involves the masseter muscle due to direct spread of a periodontal disease of the mandibular molars. Affectation of the third lower molar, which is proximal to the submasseteric space, a small, potential space, without muscular insertions can lead to an abscess in this point.[24] Radiologically there is an increase in the size of the masseter muscle with inflammatory changes of the adjacent fat, which is interpreted as myositis (Fig. 9A). If there are artifacts secondary to dental amalgams and the existence of this submasseteric space is not known, possible abscesses in this location can go unnoticed and become chronic.[25,26] This situation can cause the patients to seek medical assistance later due to the presence of episodic pain and facial swelling (Fig. 9B).

Tuberculosis can be another pathogenic agent responsible for muscular affectation, but even though it is an infection with high prevalence, extraspinal musculoskeletal affectation occurs in 1–2 per cent of the patients only. This low incidence along with indolent clinical manifestations causes

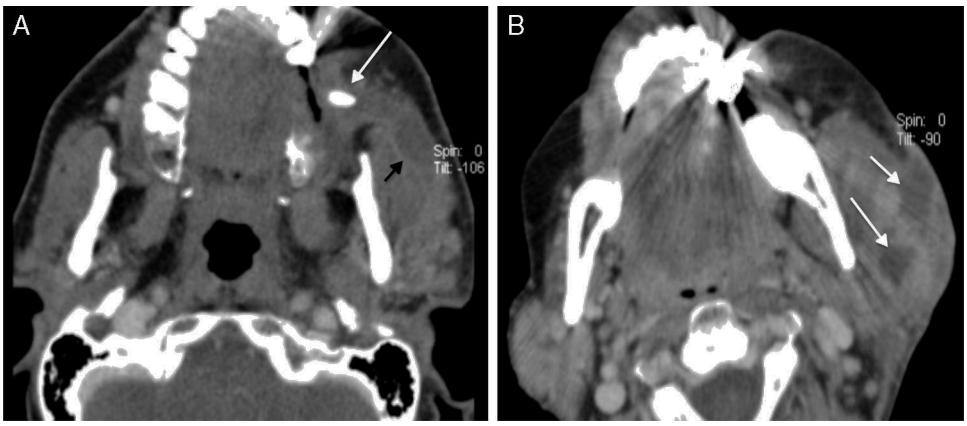

Figure 8 Salivary facial swelling. (A) Computed tomography (CT), axial section with IV contrast. Left *Parotitis* with sialoectasia (black arrow) secondary to lithiasis (white arrow). (B) CT, axial section with IV contrast of another patient with parotitis and formation of secondary *intraparotid abscesses* (white arrows).

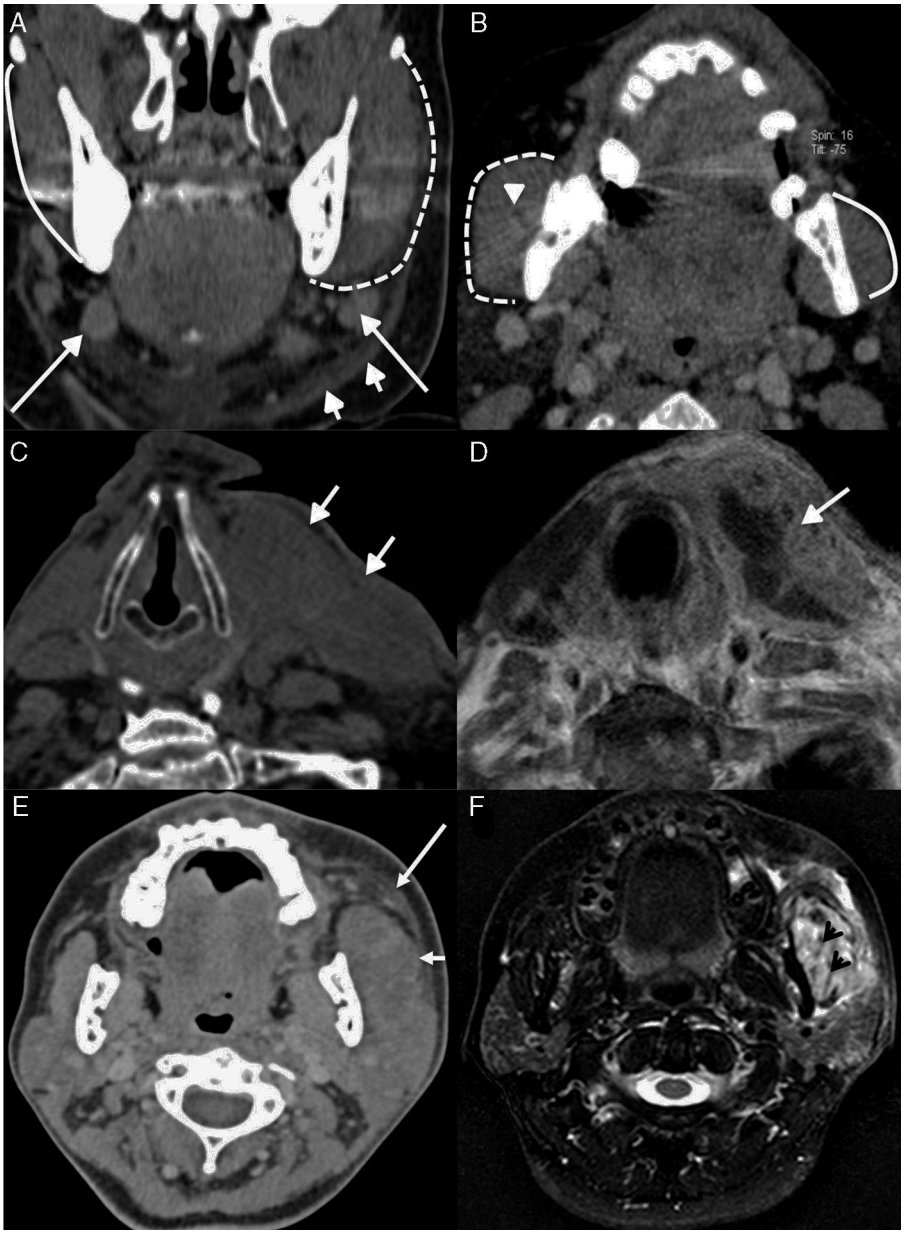

Figure 9 Muscular facial swelling. (A) Computed tomography (CT), coronal section with IV contrast. Suspicion of dental phlegmon. There is cellulitis (short arrows) and adenomegalia (long arrows) more significant in the left submandibular space secondary to a periodontal abscess of the 48th tooth (not shown). There is an increase in size and the uptake of the left masseter muscle is indicative of *myositis* (dotted outline) without clear images of abscesses (purulent content was extracted in the puncture). Compare with normal masseter muscle of the contralateral side (continuous outline). (B) CT, axial section with IV contrast. Patient with a prior history of dental phlegmon showing pain at admission in the malar region. There is myositis of the right masseter muscle (dotted outline) with evidence of a *small abscess* in the submasseteric space (arrowhead). On the left side, the muscle showed normal characteristics (continuous outline). (C) CT, axial section. Eighty-year-old man showing fluctuating left cervical swelling at admission. Absence of local warmth. The CT shows an increase in size and poor definition of the left sternocleidomastoid muscle (arrows). (D) T1-weighted MRI axial section with gadolinium of the same patient as in image C where an *intramuscular abscess* can be observed (white arrow). The microbiological study revealed tuberculosis. (E) CT, axial section with IV contrast. Woman found unconscious in a fire on the left decubitus position, with an important left facial swelling. The image shows an increase in size of the left masseter muscle (short arrow) and perimuscular cellulitis (long arrow). (F) T2-weighted MRI axial section with fat saturation of the same patient as in image E, where a type II *myositis of the masseter muscle* is confirmed, confirmed by its spotted pattern (short, black arrows).

its diagnosis to be delayed.[27] Also from the radiological point of view, abscesses appear as intramuscular lesions with thick ring enhancement, which confuses diagnosis with malignant lesions or pyogenic abscesses[28,29] (Fig. 9C–D).

Muscular inflammation can be secondary to rhabdomyolysis (Fig. 9E and F). This entity, which is caused by rupture and necrosis of the muscular fibers and the corresponding release of myoglobin, can result in kidney failure. The most common etiological factors are intense exercise, drugs and alcohol, and direct muscular lesion (traumatic or due to prolonged immobility). It is extremely rare in the neck and head region, but despite its rarity its diagnostic image is so suggestive that it will let us come to the correct diagnosis.[30–32]

Cervical

Vascular

Neck infections can associate vascular complications such as vasospasm, arteritis and its complications and Lemierre's syndrome. Sometimes these infectious vascular complications can also occur as manifestations of a distant disease.

Lemierre's syndrome was described as septic thrombophlebitis of the internal jugular vein with distant septic embolisms. Although the initial manifestations indicated that the primary infection could have several locations, now this entity is established when the location of the infection is oropharyngeal and whether or not there are septic pulmonary embolisms. The patients, generally young, healthy adults, go to the hospital complaining of pain, erythema and a palpable cervical mass after an oropharyngeal infection. In the image (Fig. 10A and B) there is an increase of size, absence of filling with contrast and poor definition of the internal jugular vein.[20,33] Treatment consists of antibiotics. The use of anticoagulants is controversial, but it seems to be beneficial when the thrombus reaches the sigmoid sinus, therefore this information should be specified in the radiological report.

Cervical *mycotic aneurisms* are rare. The term mycotic was described by Osler to refer to its fungal origin, but today this term is widely used for any aneurisms due to infections. The infection of the arterial wall is caused by direct spread, metastatic dissemination or is secondary to a previous carotid surgery.[34,35] Before the arrival of antibiotics, the most common causal agents were syphilis and tuberculosis. Today, *Staphylococcus aureus* followed by fungi (*Aspergillus*) and enterobacteria are the most common causal agents though the literature is also reporting an increase of cases associated with the human immunodeficiency virus.[36] They occur clinically with pain, fever, dysphonia and dysphagia. They can associate complications such as arterial rupture and hemorrhage (Fig. 10C–E), septic embolisms and arterial occlusions.

Adenopathic

Adenopathic affectation secondary to an infection occurs because the pathogenic agent is drained afferently to the lymphatic ganglion and activates the lymphocytes that are formed in the germinal centers. This leads to an increase of ganglionic size (reactive adenitis). If the infection progresses, ganglionic necrosis can occur (suppurative adenitis). *Staphylococcus aureus* and group A streptococci are among the most common etiological agents of this form of adenitis, and its incidence decreases with age.

Tuberculous lymphadenitis, also called scrofula, is the most common form of tuberculosis in the neck and head region. It occurs in primo-infection and usually follows pulmonary affectation. It amounts to 5 per cent of the cases of extrapulmonary ganglionic tuberculosis in immunocompetent patient and up to 50 per cent in immunodepressed ones.[29,37] Its prevalence has increased due to a greater incidence of AIDS, drug abuse and immigration. Although it can affect only one ganglionic group, it is often bilateral (one third of the cases); the posterior cervical triangle, supraclavicular region and the internal jugular chain are the most common groups. From the radiological point of view though at first they appear as solid nodules with homogeneous enhancement, they later necrotize and adhere to deep planes, which can make us mistake them for metastatic ganglia. Clinically, they can be painless and cause cutaneous fistulas, though less commonly.[23,38]

Congenital

Development abnormalities can be due to cervical inflammatory masses that appear recurrently. This clinical information is one of the clues that can help us diagnose them, given that most of the processes described in this review occur in isolation[39].

The tyroglossal duct cyst is the most common congenital lesion of the neck (it is found in 5–10 per cent of autopsies).[40] The anatomical trajectory of the formation of the thyroid gland, from the foramen cecum to the thyroid bed, indicates the potential places for its development. They are located proximally to the base of the tongue or with respect to the hyoid bone and with the prelaryngeal musculature. The uncomplicated forms are cystic lesions, with well-defined, thin walls that are easily identified in the clinical examination or through ultrasound study. Complicated forms require CT study with contrast (Fig. 11A and B) and they can entail a differential diagnosis with infected saccular cysts, dermoid cysts, ranulae or lingual abscesses of a different etiology and with necrotized ganglionic metastasis. Although Zander et al.[41] have said – and it is true that ganglionic necrotic metastasis should be considered in the differential diagnosis of a lesion or painless cervical cystic masses in an adult, this diagnosis must also be considered when there appear cervical cystic lesions with inflammatory characteristics (Fig. 11C).

The most common *branchial arch abnormalities* affect the second arch (95 per cent). The abnormalities of the first arch follow with a much lower frequency (1–4 per cent). Those of the third and fourth arches are very rare. First-arch abnormalities can occur clinically with auricular swelling, fistulas, otorrhea or parotitis. From the radiological point of view, they are seen as cystic lesions of periauricular or intraparotid location. Second branchial arch cysts are located following the anterior border of the sternocleidomastoid muscle, posterior to the submaxillary gland and laterally to the carotid space. Its radiological image is similar to that of the first arch, but its location is different and its size is usually larger. At admission most patients with cervical swelling for study, but sometimes, when they become complicated

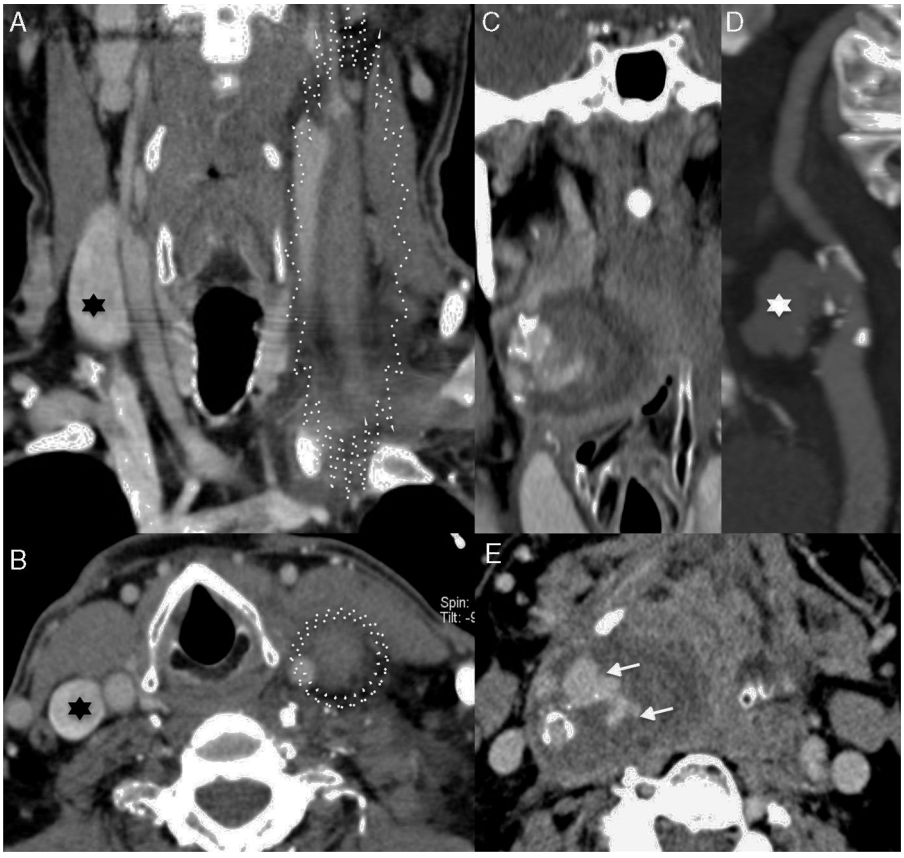

Figure 10 Vascular complications. (A) Computed tomography (CT), coronal section with IV contrast. (B) CT, axial section with IV contrast. (A and B) *Thrombophlebitis of the internal jugular vein*. Observe the absence of filling and poor definition of the left internal jugular vein (dotted silhouette), comparatively with the contralateral internal jugular vein (black asterisk). (C) CT, coronal section with IV contrast. (D) CT, sagittal oblique reconstruction of maximum pixel intensity (MPI). (E) CT, axial section with IV contrast. Patient with a history of gastroenteritis hospitalized due to parapharyngeal mass and dyspnea. She had a large aneurism (asterisk in D) of the internal carotid artery with signs of rupture (white arrows in E). The microbiological study confirmed the diagnosis of *mycotic aneurism* due to *Salmonella*.

or infected, they can occur in acute forms as inflammatory masses.

Abnormalities of the third and fourth arches are lesser known lesions. They usually appear in the form of inflammations or abscesses in the left lateral cervical triangle and/or thyroiditis after an upper respiratory tract infection (Fig. 11D–F). These findings are so indicative of these lesions that, despite their rarity, should be suspected and sought radiologically.[40,42]

Dysphagia-dyspnea

Foreign bodies

Swallowing foreign bodies occurs frequently in pediatric ages and less frequently in adults (Fig. 2B). They are usually located in the oropharynx (fish bones) or adjacent to the upper esophageal sphincter (bones). Although they can be radiopaque, it should be remembered that dental prosthetic material-existing in 1 of every 5 adult individual can be made of non radiopaque material and this way it can go unnoticed on the X-rays and even on the CT if indirect signs are not sought such as the presence of air in the esophagus associated with an increase of the adjacent soft parts.[43]

Tonsillitis and epiglottitis

Tonsillitis and epiglottitis are common infections (tonsillitis much more so). Their diagnosis is clinical, but radiological studies are necessary when the diagnosis is not clear, when clinical examination is not possible (Fig. 2C), when the patient does not respond to antibiotic treatment or when suspicious of infection of deep spaces or other complications.[1,44] Sometimes there is this diagnostic dilemma to differentiate between phlegmonous condition (which is treated with antibiotics) and abscesses (which are treated with drainage). Clinical diagnosis attains sensitivity and specificity values of 78 per cent and 50 per cent, respectively.[45] However, the use of CT with contrast, transoral or percutaneous ultrasound attains sensitivity and specificity values ranging from 100 per cent to 75 per cent respectively.[46]

Neoplasms

Some tumors of the head and neck region can have acute clinical manifestations such as cervical swelling or

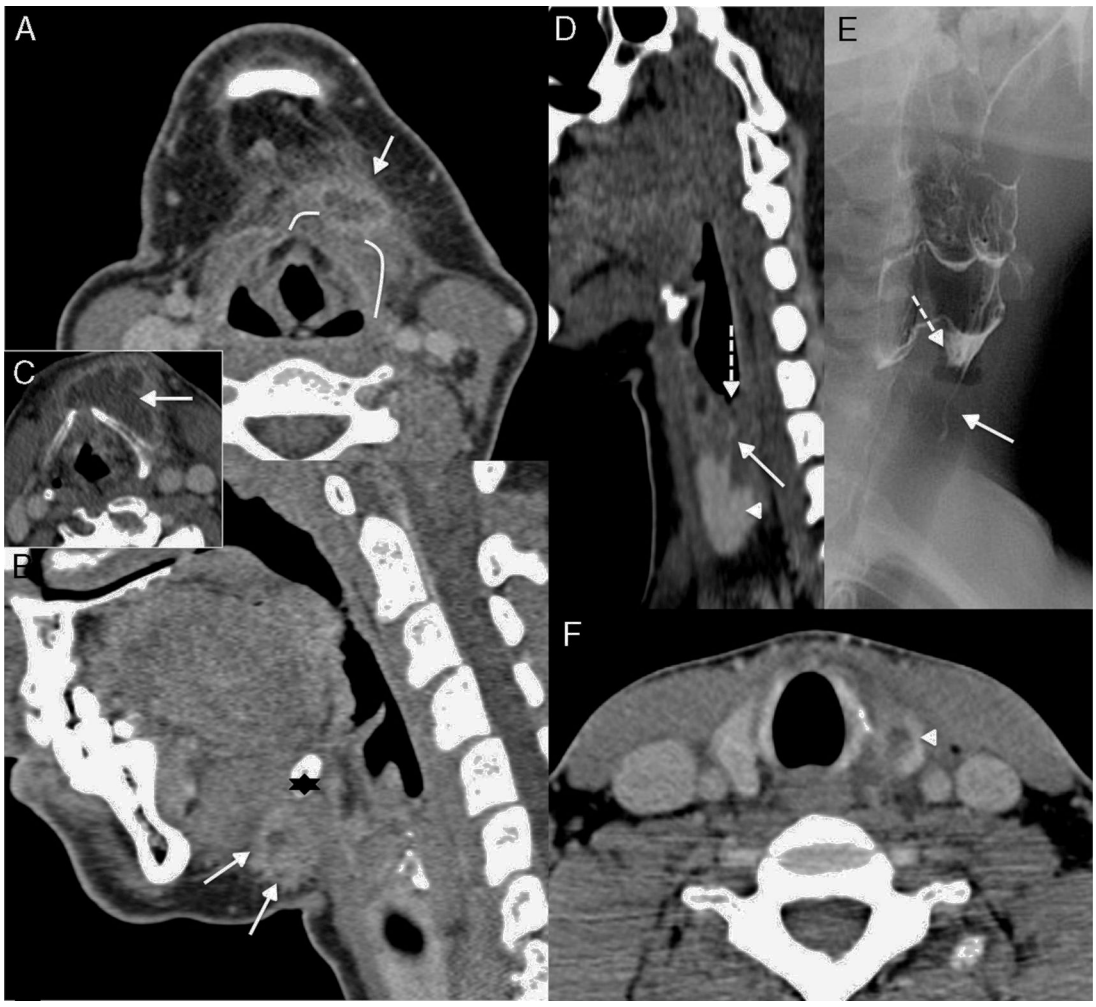

Figure 11 Congenital anomalies. (A) Computed tomography (CT), axial section with IV contrast. (B) CT, sagittal section with IV contrast. A and (B) *Complicated cyst of the thyroglossal duct*. There is a cystic nodular lesion (arrows in A and B) imbricated in the prelaryngeal musculature (dotted line in A). Most thyroglossal duct cysts are correlated with the hyoid bone (asterisk in B). (C) CT, axial section with IV contrast. It belongs to a different patient with an inflammatory lesion imbricated in the prelaryngeal musculature (white arrow). In this case, the pathological anatomy study revealed the presence of a *metastasis of an epidermoid carcinoma*. (D) CT, oblique sagittal section with IV contrast. (E) Esophagogram. (F) CT, axial section with IV contrast. (D and E) *Sinus of the third branchial arch*. There is a fistulous trajectory (continuous arrow in D and E) spreading from the pyriform sinus (dotted arrow in D and E) to the left lobe of the thyroid gland (arrowheads in D and F). The patient attended with a left lower cervical inflammatory lesion and subsequent signs of thyroiditis.

dysphagia or dyspnea when they compromise the aerodigestive ways. Performing an adequate systematic reading, considering the patient's clinical manifestations and history, and considering that some necrotized tumors or adenopathies can have a radiological expression similar to that of an abscess (Fig. 11C) can help us come to a better differential diagnosis.

Conclusion

Nontraumatic head and neck emergencies represent a very heterogeneous pathological group that can occur clinically in the type of cervical swelling, dysphagia, dyspnea and acute sensorial deficit. The role of the radiologist is to determine the location and spread of the process and identify the findings that can suggest diagnosis, assess the severity of the manifestations and possible complications.

Also there are some uncommon clinical entities that still have high morbimortality and whose radiological manifestations are very characteristic. The early identification of these specific manifestations allows us to guide the clinician toward the most appropriate treatment.

Ethical disclosures

Protection of people and animals. The authors declare that no experiments with human beings or animals have been performed while conducting this investigation.

Data confidentiality. The authors confirm that they have followed their center protocol on the publication of data from patients.

Right to privacy and informed consent. The authors confirm that in this article there are no data from patients.

Authors' contribution

BBA was responsible for the integrity of the study. The study was conceptualized by BBA and designed by BBA, MTG and YGH. Data mining was done by BBA, MTG, LEG, YGH and RRP. Data was analyzed and interpreted by BBA, MTG, LEG and RRP. Statistical Analysis was done by BBA. BBA, MTG, LEG and RRP were responsible for references. BBA, MTG, LEG, YGH, RRP were responsible for: (1) the writing of the manuscript, (2) critical review of the manuscript with intellectually relevant remarks and (3) approval of final version.

Conflicts of interests

The authors declare no conflict of interests associated with this article whatsoever.

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