Nontraumatic emergency radiology of head and neck in pediatric age

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Learning objectives

We describe characteristic image findings (x-ray, US, CT and MRI) characteristic of the non-traumatic urgent cranial-cervical pathology (subject to radiological evaluation), in the pediatric population of our environment.

Background

We describe characteristic image findings (x-ray, US, CT and MRI) characteristic of the non-traumatic urgent cranial-cervical pathology (subject to radiological evaluation), in the pediatric population of our environment.

Imaging findings OR Procedure details

-Meningeal coverings and brain pathology.

Epidural abscess

Infection by secondary contiguity to sinusitis / mastoiditis - in older children - or meningitis - in small children.

It is rare, but with a high mortality.

They usually present a concave lens morphology and cross the midline (Fig. 1 on page 6); they do not cross sutures.

Subdural empyema

Infection by secondary contiguity to sinusitis / mastoiditis - in older children - or meningitis - in small children.

The meningeal arachnoid barrier with accumulation of CSF in the subdural space is altered.

It is rare, but with a high mortality.

They usually present a "lunate" morphology and arranging in convexities - and can pass through sutures-calcarine cerebelli (Fig. 2 on page 6) or in the tent of the cerebellum.

It can associate venous thrombosis or cerebral abscess.
**Brain abscess**

It usually occurs by hematogenous spread from a primary source of infection in the joint gray matter and white matter. They can be uni or multi compartments and lonely (Fig. 3 on page 7) multiple. Four phases are described:

- Early 1: cerebritis phase (1-3 days).
- Phase 2: late cerebritis (4-9 days).
- Phase 3: formation of early capsule (10-13 days).
- Phase 4: formation of late capsule (14 days).

**Bleeding by AVM**

The AVM is a mass of dilated abnormal vascular conduits (arts. nutritional - collateral art. - nidus - dilated veins drain) without normal parenchyma.

The MAVs are vascular malformations that most commonly cause seizures or focal neurological signs.

They can be complicated by bleeding (Fig. 4 on page 8 and Fig. 5 on page 9) or vascular steal phenomenon.

It is important when it comes to grading to describe the size of the nidus, localization and venous drainage (superficial/deep).

**Acute myocardial infarction secondary to carotid artery dissection**

A tear of the intimate of the vessel that allows blood to penetrate in the arterial wall between its layers, resulting in stenosis or pseudoaneurysm, which occurs in arterial dissection.

It may occur after trauma or neck sharp turn.

The association of dissection and stroke (Fig. 6 on page 10 and Fig. 7 on page 11) in children seems to be greater than what was previously believed.

- Orbital pathology.

**Dacryocystitis**
Inflammation and dilation of lacrimal sac (inner edge) by nasolacrimal duct obstruction (stenosis or dacryolito).

The diagnosis is clinical, presenting as an internal edge mass with purulent discharge.

**Periorbital cellulitis**

Process limited to soft tissues before to orbital septum (Fig. 8 on page 12). Clinically there is an increase in volume and palpebral erythema, preserving ocular mobility.

**Orbital cellulitis**

Postseptal soft tissue inflammation usually secondary to sinusitis by perivascular dissemination.

Subperiosteal and / or retroseptal affectation (extraconal - fat, lacrimal gland and nerve-, conal - muscles - intraconal - fat, lymph nodes, ophthalmic artery/vein and optic nerve).

Subperiosteal abscesses are more frequent in adolescents and typically associated with ethmoidal sinusitis (Fig. 9 on page 13). In early stages, they can not enhance.

The described complications include: superior ophthalmic vein thrombosis, thrombosis of the cavernous sinus, meningitis and intracranial abscesses.

- Pathology of the temporal bone.

**Otitis media**

Inflammation of the middle ear. Most common infection in the first 5 years.

If there is suspicion of complications will be indicated CT / MRI.

**Acute mastoiditis**

Complication of acute otitis media.

It is secondary to obstruction of the mastoid antrum (Fig. 10 on page 14).

**Petrous Apicitis**

Complication of acute mastoiditis with spread of infection into the petrosal pneumatized apices.
Often presents with the triad VI palsy, deep facial pain and otorrhea on the same side (Gradenigo syndrome).

**Coalescing mastoiditis**

Necrosis of the bone and abscess coalescence of with subperiosteal intra / extracranial extension (Fig. 11 on page 15).

-Airway pathology.

**Foreign body aspiration**

Most common in children aged 1-3 years and the right main bronchus (Fig. 12 on page 16).

Foreign bodies are usually not radiopaque.

**Foreign body ingestion**

They are usually food and coins (Fig. 13 on page 17).

Among the complications: Esophageal perforation and mediastinitis, as well as the development of tracheoesophageal or aortoesophageal fistula.

-Tonsillar pathology.

Tonsillitis is highly prevalent in the pediatric population.

The diagnosis is clinical.

**Peritonsillar abscess**

As complication of tonsillitis may arise an abscess in the amygdala or extension to the parapharyngeal, retropharyngeal or submandibular space.

Imaging tests can help differentiate between a tonsillitis and peritonsillar abscess (Fig. 14 on page 18) (atypical clinic, little collaboration, poor response to treatment or suspicion of extension to deep neck spaces).

**Retropharyngeal abscess (prevertebral)**

Spread of infection to the retropharyngeal lymph nodes.

It may also be secondary to trauma or iatrogenic.

It is most common in children under 6 years.
In the lateral cervical radiograph (Fig. 15 on page 19) should be considered if there is cervical flexion or incomplete inspiration. The presence of gas in prevertebral soft tissues, helps differentiate between retropharyngeal abscess and cellulitis. Complications include compromise of the airway, mediastinitis, cervical necrotizing infection, vein jugular thrombosis, aspiration of pus (empyema or pneumonia).

Images for this section:

![Images](image_url)

**Figure 1. Epidural abscess and leptomeningitis in a child with fever, stiffness neck and left hemiparesis.** Sagittal cranial CT scan (a): hypodense extraaxial front collection with concave morphology. MRI, T1W axial (b), with contrast: Significant enhancement of the leptomeninges, most evident in the right convexity. Extraaxial, hypointense and frontobasal collection, that crosses mid-line (epidural).

**Fig. 1**
Figure 2. Empyema subdural and leptomenigitis in a child with fever, stiffness neck and left hemiparesis. Cranial axial CT scan (a), without IVC: laminar, extraaxial and parasagittal (right) collection (subdural), hypodense with discreet displacement of midline. MRI, T1W axial (b) with contrast: significant enhancement of the leptomeninges (right hemispheric predominance), and hypointense subdural collection along the right bank of the calcarine cerebelli and the right convexity.

Fig. 2
Figure 3. Brain abscess in a child with fever, stiffness of neck and left hemiparesis. MRI T2W (a) and axial T1W with contrast (b): ovoid, intraaxial, parasagittal (right) and occipital collection, with hyperintense (T2) and hypointense signal with annular enhancement (T1) after administration of contrast. There is cytotoxic edema, that has a compressive effect on right ventricle.
Figure 4. Parenchymal hemorrhage secondary to AVM in a child with severe headache. CT cranial, coronal (a) and axial (b): intraaxial hyperdense collection, with perilesional edema, in the right occipital lobe.
Figure 5. Parenchymal hemorrhage secondary to AVM in a child with severe headache. MRI, T2W axial (a): tubular and serpiginous "Empty flow" in the occipital hemorrhage, associated with discrete perilesional edema. TOF study of the circle of Willis (b and c): abnormal blood vessels afferent to the AVM, dependent on the right PCA.

Fig. 5
Figure 6. Ischemic infarction secondary to dissection of carotid in a child with partial crisis in right hemibody. Brain CT axial, sagittal and coronal (a, b and c), without IVC: Hipodensity frontoparietal left cortex.

Fig. 6
Figure 7. Ischemic infarction secondary to dissection of carotid in a child with partial crisis in right hemibody. MRI, diffusion and axial Flair (a and b): thickening of left frontoparietal cortex with restriction of diffusion and discreet hypersenal (Flair). TOF study of the circle of Willis (c): irregular stenosis of the distal ICA (intracranial route). Decrease in the flow of the branches of the left MCA signal.

Fig. 7
Figure 8. Preseptal cellulitis in a child with pain in the right orbit.
TC cranial without CIV: swelling and edema of right periorbicular soft tissue (preseptal). Occupation of straight ethmoidal cells and mucosal thickening in the right sphenoid sinus.

Fig. 8
Figure 9. Abscess subperiostico in a child with pain to the left eyepiece mobilization, fever and malaise. CT of orbits and sinuses, axial (a) with soft tissues window and coronal (b) with bone window: occupation of the ethmoidal cells and left maxillary sinus. Subperiosteal collection, with displacement of gracilis muscle.
Figure 10. Otomastoiditis in an infant with acute otitis media. CT with bone window: total occupation of both middle ears, without signs of bone resorption.

Fig. 10
Figure 11. Coalescing mastoiditis in an infant. CT with bone window: occupation of the middle ear. It is associated to bone erosion of mastoid of the temporal bone and soft tissue increased with gas bubbles.
Figure 12. An infant who aspirated a foreign body (piece of plastic in right main bronchus). Radiography in inspiration (a) and RLD (b): "Air trapping" in right lung, small pneummediastinum. Radio-opaque foreign body is not objective.
Figure 13. A child who had swallowed a coin. AP chest x-ray: radiopaque (density metal) foreign body in upper third of the esophagus.

Fig. 13
**Figure 14.** Left peritonsillar abscess on an infant treated by acute tonsillitis with bad evolution. CT cervical with IVC: hypodense collection in the left tonsillar with peripheral enhancement, causing mass effect on the oropharynx.

**Figure 15.** Retropharyngeal abscess in a child with fever, neck pain, and malaise. Cervical radiography in lateral projection: widening of the prevertebral soft tissue. Inversion of the physiologic cervical lordosis.
Conclusion

All these patients benefited from an urgent radiological study. Nontraumatic pediatric head and neck emergencies can manifest with nonspecific clinic. Radiology was crucial for the correct diagnosis.

References


Personal Information