Imaging of sinonasal infections

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Rhinosinusitis- definition

inflammation of the nose and the paranasal sinuses characterised by 2 or more symptoms, one of which should be

• either nasal blockage/obstruction/congestion or

• nasal discharge (anterior/posterior nasal drip):
  ± facial pain/pressure,
  ± reduction or loss of smell

and either endoscopic signs of:
  ± mucopurulent discharge from middle meatus
  ± oedema/mucosal obstruction primarily in middle meatus
  ± nasal polyps

and/or CT changes:
  mucosal changes within ostiomeatal complex and/or sinuses

EPOS  European Position Paper on Rhinosinusitus and Nasal Polyps 2012
www. rhinologyjournal.com
Acute rhinosinusitis
⇒ symptoms lasting < 12 weeks

**Etiology**

**Infection**
- viral
- bacterial
- fungal

**Allergy**

**Extrinsic/exposure related**

**Systemic predispositions**
- cystic fibrosis
- Kartagener
- Wegener's S.
- immunosuppression

**Risk factors**

- asthma
- allergy
- aspirin hypersensitivity
- smoking
- toxic inhalation
Conventional x-rays

limited role only: Waters` (occipito-mental) view

- confirm diagnosis in acute maxillary sinusitis,
- reassure diagnosis after insufficient tx response

**Sensitivity** for max. sinus: 67.7%, specificity 87.6%, accuracy 78.6%, PPV 82.5%, NPV 76.9%.

paranasal sinus anatomy is closely related to physiology (osteo-meatal complex)
Adequate positioning of patients and MPR reconstruction plane!!

hard palate horizontal!  ↑  plane of coronal reconstruction
Acute sinusitis

Imaging:
- air-fluid levels,
- bubbly secretions,
- asymmetric mucosal thickening

Report Anatomy + pathology
Acute rhino-sinusitis

- Acute sinusitis diagnosed on clinical grounds

Beware: ↑ incidence of sinumucosal abnormalities ± fluid levels in asymptomatic individuals
Acute rhinosinusitis

Fluid protein \(\rightarrow\) CT density \(\uparrow\)
MR T1 signal \(\uparrow\)
Unilateral disease iv contrast ?
Acute rhinosinusitis ⇒ complications

- Subperiosteal orbital abscess
- Orbital phlegmonous infiltration
- Cavernous sinus thrombosis
- Epidural extension
- Subdural extension
- Meningitis - cerebritis - abscess
Complications

Clinical visibility limited to superficial component!

Sinus infection $\Rightarrow$ subperiosteal orbital abscess
$\Rightarrow$ sinus source? Odontogenic origin

Report? Fronto- ethmoid cell!
Acute pansinusitis

⇒ orbital phlegmonous infiltration

Ethmoid, maxillary sinus origin

⇒ superior ophthalmic vein thrombosis
Acute sphenoid sinus inflammation

Sphenoiditis $\Rightarrow$ submucosal transosseous veins
$\rightarrow$ cavernous sinus thrombosis $\rightarrow$ SOV thrombophlebitis
Individual anatomy
⇒ varying extension of infection!

Sphenoiditis ⇒ cavernous sinus thrombosis ≠ superior ophthalmic vein
→ Speno-parietal sinus thrombosis ⇒ cerebral abscess
Acute ethmoid sinus inflammation
⇒ subperiosteal orbital abscess

+ epidural right frontal abscess
Following frontal sinusitis

$\Rightarrow$ pachy-leptomeningitis + subdural empyema
Chronic rhinosinusitis

presence of 2 or more symptoms one of which either nasal blockage/obstruction for \( \geq 12 \) weeks;

- congestion or
- nasal discharge ant/post. nasal drip
  \( \pm \) facial pain/pressure; \( \pm \) reduction or loss of smell;

without polyps

with polyps
Chronic rhinosinusitis

- mucosal thickening
- inspissated secretions
- osseous thickening and sclerosis
- ± polyposis
Imaging in patients with cRS:

- response to medical Tx?
- extent of (residual) disease
- anatomy of drainage pathways, variations
- unilateral disease? source
- prior surgery (anatomy, scarring?)
- complications (mucocele)
1. ostiomeatal complex pattern
2. infundibular pattern
3. spheno-ethmoid recess pattern
4. sinonasal polyposis pattern

Inflammatory swelling of sinonasal mucosa + retained inspissated secretions
Sinonasal polyps

Nonneoplastic inflammatory swelling of sinonasal mucosa causing buckling and polyps predominantly along lateral nasal wall and roof and in anterior sinonasal cavity
cRS: Predisposing anatomic ± acquired factors
Unilateral chronic rhinosinusitis

CT ⇒ source

odontogenic infection

mycetoma
Unilateral chronic rhinosinusitis antrochoanal polyp

Indicate plane of reconstruction

Inflammatory polyp due to edematous hypertrophy of respiratory epithelium.
Chronic fungal disease - noninvasive type -

maxillary sinus most common calcification/metall density → fungus ball
Chronic fungal disease
- expansile allergic type -

- sphenoid, -ethmoid, sinus expansion, pressure erosion
- dense /hypointense secretions, mucosal thinning
Chronic fungal disease
- expansile allergic type -

allergic mucin, eosinophils, Charcot Leyden crystals
Chronic fungal disease
- invasive “pseudotumoral“ type -

small tumor like lesion, sphenoid sinus most common
osteolysis + sclerosis → MR assessment
invasive “pseudotumoral” type

local mucosa invasion, osteolysis- sclerosis neurovascular infiltration
Complications → mucocele

Frontal 60-65%, ethmoid 25%, maxillary 5-10%, sphenoid 2-5%

Sinus expansion with smooth remodelling of walls
→ frontal sinus mucocele

Epi- dural extension

Image fusion  CT- MR
Late complications:
⇒ subgaleal abscess

CT → osseous situation  MR → soft tissue differentiation
→ optic nerve compression
Mimics 1: Odontogenic cyst

Mucocele?
Mimics 2: Inverted papilloma

Chronic inflammatory polyp?
IgG4 RD: Eosinophilic angiocentric fibrosis

IgG4 RD fibroinflammatory condition w lymphoplasmacytic infiltrate, IgG4+ plasma cells, often elevated serum IgG4 + perivascular fibrosis
Advanced multiparametric imaging

- T2 MR: morphology
- MR diffusion: cellularity
- MR DSC perfusion: Angiocentric lymphoma
Sinonasal infections

Dichotomized into acute and chronic
• Acute: assessment of complications
• Chronic: Heterogenous manifestations
• Pattern of OMC and sinus involvement
• Localize source of infection
• Establish diagnosis in uncommon manifestations
• Provide treatment oriented imaging
• Use high resolution and advanced imaging for diagnosis, narrow differential diagnosis
Thank you for your attention

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