CHRONIC RHINOSINUSITIS & NASAL POLYPS
APPROACH FOR MANAGEMENT

By: Ibrahim Alarifi
Introduction

- Rhinitis and sinusitis usually coexist and are concurrent in most individuals; thus, the correct terminology is now rhinosinusitis.
- Mucosa of the nose is a continuation of that of sinuses and it is a respiratory epithelium (ciliated, pseudostratified columnar epithelium with interspersed Goblet cells).
- The mucosa is attached directly to the bone.
Mucociliary action and mucous blanket:
The nose is coated with **ciliated epithelial cells** which move a blanket of **mucus** posteriorly towards the nasopharynx.
Definition of rhinosinusitis:

(EPOS 2012)

Rhinosinusitis in adults is defined as:

- inflammation of the nose and the paranasal sinuses characterised by two 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:
  - nasal polyps, and/or
  - mucopurulent discharge primarily from middle meatus and/or
  - oedema/mucosal obstruction primarily in middle meatus

and/or

- CT changes:
  - mucosal changes within the ostiomeatal complex and/or sinuses
## Rhinosinusitis classification

<table>
<thead>
<tr>
<th>Duration of the disease</th>
<th>Acute:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 12 weeks</td>
</tr>
<tr>
<td></td>
<td>complete resolution of symptoms.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥12 weeks symptoms</td>
</tr>
<tr>
<td>without complete resolution of symptoms.</td>
</tr>
<tr>
<td>(may also be subject to exacerbations)</td>
</tr>
</tbody>
</table>
Definition of CRS (EPOS 2012)

Rhinosinusitis in adults is defined as:

- inflammation of the nose and the paranasal sinuses characterised by two 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:
  - nasal polyps, and/or
  - mucopurulent discharge primarily from middle meatus and/or
  - oedema/mucosal obstruction primarily in middle meatus

and/or

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

for ≥12 weeks;
CRS may manifest as one of three major clinical syndromes:

- **CRS** *without* nasal polyps,
- **CRS** *with* nasal polyps, or
- allergic fungal rhinosinusitis

These classifications are significant, particularly regarding therapy.
Epidemiology

- The overall prevalence of CRS in the United States is **146 per 1000 population** and it is increasing yearly!
- 18-22 million physician visits in the United States each year.
- Cost of **$3.4-5 billion** annually
- CRS is a common disease worldwide, particularly in places with high levels of **atmospheric pollution**.
In a survey on the prevalence of chronic conditions, it was estimated that CRS, defined as having ‘sinus trouble’ for more than 3 months in the year before the interview, affects 15.5% of the total population in the United States ranking this condition second in prevalence among all chronic conditions. Subsequently the high prevalence of CRS was confirmed by another survey suggesting that 16% of the adult US population has CRS.

Recent data have demonstrated that CRS affects approximately 5–15% of the general population both in Europe and the USA. The prevalence of doctor-diagnosed CRS was 2-4%.
Current thinking supports that chronic rhinosinusitis is predominantly a multifactorial inflammatory disease.
The above graphics suggest the multifactorial etiology of chronic rhinosinusitis.
**SINUS HEALTH CYCLE**

- Mucus composition is normal
- Mucus secretion is normal
- Inhaled pollutants are absorbed in the tissue lining
- Inhaled particles and bacteria are removed by mucociliary clearance
- Mucociliary flow prevents local tissue damage
- Host defenses resist infection

**CYCLE LEADING TO CHRONIC SINUSITIS**

- Mucus secretions stagnate
- Nasal congestion or anatomic obstruction blocks air flow and drainage
- Cilia and epithelium are damaged
- Lack of drainage and thick mucus create culture medium for bacterial growth in closed cavity

**OSTIUM IS OPEN**

- Mucosal thickening creates further blockage
- Retained mucus secretions cause tissue inflammation
- Bacterial infection develops in the sinus cavity

**OSTIUM IS CLOSED**
Polyp cells produce cytokines and other inflammatory mediators \( \rightarrow \) recruit, activate, and enhance the survival of eosinophils.

Activated eosinophils secrete **IL-3 & IL-5**, which inhibit eosinophils **apoptosis** and further promote recruitment and survival in a positive feedback loop.
CRS can be typically described as a dysfunctional host-environment interaction at the site of interface, which occurs in the nose and paranasal sinuses.
Factors associated with CRS
1) **Ciliary impairment:**

- Kartagener’s syndrome and primary ciliary dyskinesia (irreversible).
- Secondary ciliary dyskinesia (reversible).
- Cystic fibrosis NPs are present in about 40% of patients with CF (neutrophilic non eosinophilic)
2) Atopy:

- AR cause edema obstruction of OMC
- Benninger reported that 54% of outpatients with CRS had positive skin prick tests
- Notwithstanding the lack of hard epidemiologic evidence for a clear causal relationship between allergy and CRS, it is clear that failure to address allergy as a contributing factor to CRS diminishes the probability of success of a surgical intervention
Kern found NP in 25.6% of patients with allergy compared to 3.9% in a control population.


Recently, Bachert at al. found an association between levels of both total and specific IgE and eosinophilic infiltration in NP. These findings were unrelated to skin prick test results.
Considerable overlap between asthma and nasal comorbidities confirm a close relationship between nasal disease and asthma. The presence of asthma is a negative predictor of outcome after ESS for CRS w/s NP.
3) Asthma

- All patients with steroid-dependant asthma had abnormal mucosal changes on CT compared to 88% with mild to moderate asthma

- GA2LEN studied over 52,000 adults aged 18-75 years and living in 19 centres in 12 countries and concluded that there was a strong association of asthma with CRS. The association with asthma was stronger in those reporting both CRS and allergic rhinitis
- Asthma worsens with CSR exacerbation
- Usually treating the PNS improves the asthma
In patients with aspirin sensitivity, 36-96% have CRSwNP.
4) Aspirin sensitivity

- In patients with aspirin sensitivity 36-96% have CRSwNP and up to 96% have radiographic changes.


- Patients with aspirin sensitivity, asthma and NP are usually non-atopic and the prevalence increases over the age of 40 years (*Samter’s triad*)
5) Immunocompromised state
6) Pregnancy and endocrine state
7) Anatomical factors (controversial)

- There is no evidence for a causal correlation between nasal anatomic variations in general and the incidence of CRS.
- Some studies have found a deviation of more than 3mm from the midline to be more prevalent in rhinosinusitis whilst others have not.

8) Biofilms

- Bachert et al. investigated 70 patients and demonstrated that mucosal inflammation in nasal polyps orchestrated by Th2 cytokines and amplified by S. aureus enterotoxins is characterized by an increased eosinophilic inflammation and formation of IgE antibodies.

Biofilms and/or intracellular residence of bacteria may increase resistance to standard therapy.
9) Environmental factors

- Smoking
- Pollution

10) Iatrogenic factors

Among a group of 42 patients with mucocoeles, 11 had prior surgery within 2 years prior to presentation.

11) H. pylori and laryngopharyngeal reflux

- *H. pylori DNA has been detected in between 11% and 33% of sinus samples from patients with CRSsNP but not from controls*

All of these factors can play a role in disruption of the intrinsic mucociliary transport system. This is because an alteration in sinus ostia patency, ciliary function, or the quality of secretions leads to stagnation of secretions, decreased pH levels, and lowered oxygen tension within the sinus. These changes create a favorable environment for bacterial growth that, in turn, further contributes to increased mucosal inflammation.
Diagnosis
Symptoms present longer than 12 weeks
Two 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;

Signs
• ENT examination, endoscopy;
• review primary care physician’s diagnosis and treatment;
• questionnaire for allergy and if positive, allergy testing if it has not already been done.

Treatment
For treatment evidence and recommendations for CRSsNP.
Treatment should be based on severity of symptoms
• Decide on severity of symptomatology using VAS and endoscope.

Acute exacerbations of CRS should be treated like acute rhinosinusitis.
Severity of the disease

The disease can be divided into MILD, MODERATE and SEVERE based on total severity visual analogue scale (VAS) score (0 - 10):

- **MILD** = VAS 0-3
- **MODERATE** = VAS >3-7
- **SEVERE** = VAS >7-10

Subjective analysis of the severity help in guiding the management
Management of CRS
EPOS 2012
Management Goals

- The goal of CRS treatment is to achieve and maintain clinical control. Control is defined as a disease state in which the patients do not have symptoms or the symptoms are not bothersome, if possible combined with a healthy or almost healthy mucosa and only the need for local medication.

CRSsNP in adults management scheme for ENT-specialists

2 symptoms: one of which should be nasal obstruction or discoloured discharge
+/- frontal pain, headache
+/- smell disturbance
ENT examination including endoscopy
consider CT scan
check for allergy
consider diagnosis and treatment of co-morbidities eg. asthma

mild
VAS 0-3
no serious mucosal disease at endoscopy

- topical steroids
- nasal saline irrigation

- improvement

- follow-up + nasal saline irrigation topical steroids

no improvement after 3 months

- topical steroids
- nasal saline irrigation
- culture
- consider long term antibiotics (if IgE is not elevated)

- CT scan
- if not done before

- no improvement

- consider surgery

moderate/severe
VAS >3-10
mucosal disease at endoscopy

CT scan

- consider surgery

- follow up + topical steroids
- nasal saline irrigation
- culture
- consider long term antibiotics

consider other diagnosis
unilateral symptoms
bleeding
crusting
cacosmia

orbital symptoms:
peri-orbital oedema/erythema
displaced globe
double or reduced vision
ophthalmoplegia

severe frontal headache
frontal swelling
signs of meningitis
neurological signs

urgent investigation and intervention
CRSwNP management scheme for ENT-specialists

2 symptoms: one of which should be nasal obstruction or discoloured discharge
+/- frontal pain, headache
+/- smell disturbance
ENT examination including endoscopy (size of polyps)
consider CT scan
consider diagnosis and treatment of co-morbidities

Mild
VAS 0-3
no serious mucosal disease at endoscopy

- topical steroid spray
- review after 3 months
- improvement
- continue with topical steroids
- review every 6 months

Moderate
VAS >3-7
mucosal disease at endoscopy

- topical steroid spray
- consider increase dose
- consider drops
- consider doxycycline
- no improvement

Severe
VAS >7-10
mucosal disease at endoscopy

- topical steroids
- oral steroids (short course)
- review after 1 month
- improvement

- CT scan
- surgery

- follow up
  + nasal irrigation
  + topical ± oral steroids
  ± long term antibiotics

Consider other diagnosis
unilateral symptoms
bleeding
crusting
cacosmia
orbital symptoms:
peri-orbital oedema/erythema
displaced globe
double or reduced vision
ophthalmoplegia
severe frontal headache
frontal swelling
signs of meningitis
neurological signs

Urgent investigation and intervention
Evidence based management

Table 1.1. Category of evidence (10).

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td>Evidence from meta-analysis of randomised controlled trials</td>
</tr>
<tr>
<td>Ib</td>
<td>Evidence from at least one randomised controlled trial</td>
</tr>
<tr>
<td>IIa</td>
<td>Evidence from at least one controlled study without randomisation</td>
</tr>
<tr>
<td>IIb</td>
<td>Evidence from at least one other type of quasi-experimental study</td>
</tr>
<tr>
<td>III</td>
<td>Evidence from non-experimental descriptive studies, such as comparative studies, correlation studies, and case-control studies</td>
</tr>
<tr>
<td>IV</td>
<td>Evidence from expert committee reports or opinions or clinical experience of respected authorities, or both</td>
</tr>
</tbody>
</table>

Table 1.2. Strength of recommendation.

<table>
<thead>
<tr>
<th>Strength</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Directly based on category I evidence</td>
</tr>
<tr>
<td>B</td>
<td>Directly based on category II evidence or extrapolated recommendation from category I evidence</td>
</tr>
<tr>
<td>C</td>
<td>Directly based on category III evidence or extrapolated recommendation from category I or II evidence</td>
</tr>
<tr>
<td>D</td>
<td>Directly based on category IV evidence or extrapolated recommendation from category I, II or III evidence</td>
</tr>
<tr>
<td>Therapy</td>
<td>Level</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>steroid – topical</td>
<td>Ia</td>
</tr>
<tr>
<td>nasal saline irrigation</td>
<td>Ia</td>
</tr>
<tr>
<td>bacterial lysates (OM-85 BV)</td>
<td>Ib</td>
</tr>
<tr>
<td>oral antibiotic therapy short term</td>
<td>II</td>
</tr>
<tr>
<td>oral antibiotic therapy long term</td>
<td>Ib</td>
</tr>
<tr>
<td>steroid – oral</td>
<td>IV</td>
</tr>
<tr>
<td>mucolytics</td>
<td>III</td>
</tr>
<tr>
<td>proton pump inhibitors</td>
<td>III</td>
</tr>
<tr>
<td>decongestant oral / topical</td>
<td>no data on single use</td>
</tr>
<tr>
<td>allergen avoidance in allergic patients</td>
<td>IV</td>
</tr>
<tr>
<td>oral antihistamine added in allergic patients</td>
<td>no data</td>
</tr>
<tr>
<td>herbal medicine</td>
<td>no data</td>
</tr>
<tr>
<td>immunotherapy</td>
<td>no data</td>
</tr>
<tr>
<td>probiotics</td>
<td>Ib (-)</td>
</tr>
<tr>
<td>antimycotics – topical</td>
<td>Ib (-)</td>
</tr>
<tr>
<td>antimycotics - systemic</td>
<td>no data</td>
</tr>
<tr>
<td>antibiotics – topical</td>
<td>Ib (-)</td>
</tr>
<tr>
<td>Therapy</td>
<td>Level</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>topical steroids</td>
<td>Ia</td>
</tr>
<tr>
<td>oral steroids</td>
<td>Ia</td>
</tr>
<tr>
<td>oral antibiotics short term &lt;4 weeks</td>
<td>1b and 1b(-)</td>
</tr>
<tr>
<td>oral antibiotic long term ≥ 12 weeks</td>
<td>III</td>
</tr>
<tr>
<td>capsaicin</td>
<td>II</td>
</tr>
<tr>
<td>proton pump inhibitors</td>
<td>II</td>
</tr>
<tr>
<td>aspirin desensitisation</td>
<td>II</td>
</tr>
<tr>
<td>furosemide</td>
<td>III</td>
</tr>
<tr>
<td>immunosuppressants</td>
<td>IV</td>
</tr>
<tr>
<td>nasal saline irrigation</td>
<td>Ia, no data in single use</td>
</tr>
<tr>
<td>topical antibiotics</td>
<td>no data</td>
</tr>
<tr>
<td>anti-II5</td>
<td>no data</td>
</tr>
<tr>
<td>phytotherapy</td>
<td>no data</td>
</tr>
<tr>
<td>decongestant topical / oral</td>
<td>no data</td>
</tr>
<tr>
<td>mucolytics</td>
<td>no data</td>
</tr>
<tr>
<td>oral antihistamine in allergic patients</td>
<td>no data</td>
</tr>
<tr>
<td>antimycotics – topical</td>
<td>Ia (-) **</td>
</tr>
<tr>
<td>antimycotics – systemic</td>
<td>Ia (-)#</td>
</tr>
<tr>
<td>anti leukotrienes</td>
<td>Ia (-)</td>
</tr>
<tr>
<td>anti-IgE</td>
<td>Ia (-)</td>
</tr>
</tbody>
</table>
# Treatment Evidence and Recommendations: Postoperative Treatment for Adults with Chronic Rhinosinusitis Without Nasal Polyps *

<table>
<thead>
<tr>
<th>Therapy</th>
<th>Level</th>
<th>Grade of recommendation</th>
<th>Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>steroid – topical</td>
<td>Ia</td>
<td>A</td>
<td>yes</td>
</tr>
<tr>
<td>nasal saline irrigation</td>
<td>Ia</td>
<td>A</td>
<td>yes</td>
</tr>
<tr>
<td>nasal saline irrigation with xylitol</td>
<td>Ib</td>
<td>A</td>
<td>yes</td>
</tr>
<tr>
<td>oral antibiotic therapy short term &lt; 4 weeks</td>
<td>II</td>
<td>B</td>
<td>during exacerbations</td>
</tr>
<tr>
<td>nasal saline irrigation with sodium hypochlorite</td>
<td>IIb</td>
<td>B</td>
<td>yes</td>
</tr>
<tr>
<td>oral antibiotic therapy long term ≥12 weeks**</td>
<td>Ib</td>
<td>C</td>
<td>yes, especially if IgE is not elevated</td>
</tr>
<tr>
<td>nasal saline irrigation with babyshampoo</td>
<td>III</td>
<td>C</td>
<td>no</td>
</tr>
<tr>
<td>steroid – oral</td>
<td>IV</td>
<td>C</td>
<td>unclear</td>
</tr>
<tr>
<td>antibiotics – topical</td>
<td>Ib (-)</td>
<td>A(-) $</td>
<td>no</td>
</tr>
<tr>
<td>Therapy</td>
<td>Level</td>
<td>Grade of recommendation</td>
<td>Relevance</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------</td>
<td>-------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>topical steroids</td>
<td>la</td>
<td>A</td>
<td>yes</td>
</tr>
<tr>
<td>oral steroids</td>
<td>la</td>
<td>A</td>
<td>yes</td>
</tr>
<tr>
<td>oral antibiotics short term &lt;4 weeks</td>
<td>lb</td>
<td>A</td>
<td>yes, small effect</td>
</tr>
<tr>
<td>anti-IL-5</td>
<td>lb</td>
<td>A</td>
<td>yes</td>
</tr>
<tr>
<td>oral antibiotics long term &gt; 12 weeks</td>
<td>lb</td>
<td>C**</td>
<td>yes, only when IgE is not increased</td>
</tr>
<tr>
<td>oral antihistamines in allergic patients</td>
<td>lb</td>
<td>C</td>
<td>unclear</td>
</tr>
<tr>
<td>furosemide</td>
<td>III</td>
<td>D</td>
<td>no</td>
</tr>
<tr>
<td>nasal saline irrigation</td>
<td>no data</td>
<td>D</td>
<td>unclear</td>
</tr>
<tr>
<td>anti leukotrienes</td>
<td>lb(-)*</td>
<td>A(-)§</td>
<td>no</td>
</tr>
<tr>
<td>anti-IgE%</td>
<td>lb(-)</td>
<td>C</td>
<td>unclear</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Controlled (all of the following)</td>
<td>Partly Controlled (at least one present)</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Nasal blockage</td>
<td>Not present or not bothersome</td>
<td>Present on most days of the week</td>
<td>Three or more features of partly controlled CRS</td>
</tr>
<tr>
<td>Rhinorrhea/Postnasal drip</td>
<td>Little and mucous</td>
<td>Mucopurulent on most days of the week</td>
<td></td>
</tr>
<tr>
<td>Facial pain/headache</td>
<td>Not present or not bothersome</td>
<td>Present</td>
<td></td>
</tr>
<tr>
<td>Smell</td>
<td>Normal or only slightly impaired</td>
<td>Impaired</td>
<td></td>
</tr>
<tr>
<td>Sleep disturbance or fatigue</td>
<td>Not impaired</td>
<td>Impaired</td>
<td></td>
</tr>
<tr>
<td>Nasal endoscopy (if available)</td>
<td>Healthy or almost healthy mucosa</td>
<td>Diseased mucosa (nasal polyps, mucopurulent secretions, inflamed mucosa)</td>
<td></td>
</tr>
<tr>
<td>Systemic medication needed to</td>
<td>Not needed</td>
<td>Need of a course of antibiotics or systemic corticosteroids in the last three</td>
<td>Need of long term antibiotics or systemic corticosteroids in the last month</td>
</tr>
<tr>
<td>control disease</td>
<td></td>
<td>months</td>
<td></td>
</tr>
</tbody>
</table>
Difficult to treat CRS

- Patients who do not reach an acceptable level of control despite adequate surgery, intranasal corticosteroid treatment and up to 2 short courses of antibiotics or systemic corticosteroids in the last year can be considered to have difficult-to-treat rhinosinusitis.
Thank you,