



Acute Rhinosinusitis

Introduction

Rhinosinusitis (RS) refers to the inflammation of mucosal lining in nasal cavity, nasopharynx and paranasal sinuses. Acute RS (ARS) has a duration of < 12 weeks while chronic RS (CRS) lasts for ≥ 12 week without complete resolution of symptoms. (1) CRS tends to be caused by underlying noninfectious etiologies such as allergy, ciliary dyskinesia and exposure to environmental pollutants, whereas ARS is usually caused by viral infection associated with common cold (acute viral rhinosinusitis, or AVRS). (2) When secondary bacterial infection occurs, acute bacterial rhinosinusitis (ABRS) develops.

Epidemiology and Aetiology

AVRS is very common. It has been estimated that adults suffer two to five episodes of AVRS (or colds) per year and school children 7 to 10 colds per year. (1) ABRS is more frequent in children than adults. It is estimated that 6-9% of viral common colds in children are complicated by bacterial rhinosinusitis. (4, 5, 6) For adults, the rate is 0.5-2%. (7) The prevalence peaks at 4-7 years old instead of infancy because of anatomical differences. The fact that antibiotics are often prescribed for acute otitis media in infancy may also prevent ABRS development. (2) *Streptococcus pneumoniae* (41%), *Haemophilus influenzae* (nontypeable) (35%) and *Moraxella catarrhalis* (4%) are the principal bacterial pathogens for ABRS. *Staphylococcus aureus*, Streptococcal species and anaerobes (from odontogenic infections) may occasionally be found. (8)

Clinical features

Clinical features of rhinosinusitis include: cough, nasal symptoms, fever, halitosis, headache, facial pain and swelling. Cough is worse at night due to postnasal drip. The appearance of nasal discharge ranges from watery to purulent, thus cannot reliably indicate bacterial or viral origin. Fever usually resolves within 48 hours. High fever $\geq 39^{\circ}\text{C}$ lasting for 3 days or more points towards bacterial infection. Facial tenderness may occur when upper molars are percussed or cheekbones are pressed, which are less common in children than adults. (2)

AVRS has a duration of less than 7-10 days. (1, 9) If there is no improvement towards the end of the 10-day course, ABRS should be suspected. It is now rare to encounter complications in ABRS. The estimated incidence of serious complications of ABRS in overseas report is 1:12 000 cases per year for children and 1:32 000 cases per year in adults. (10) These serious complications involve orbital and intracranial areas e.g. meningitis, orbital cellulitis, brain abscess and cavernous sinus thrombosis. Red flags for urgent referral include systemic toxicity, altered mental status, severe headache, and swelling of the orbit or change in visual acuity. (9, 11)

Diagnosis

The following diagnostic criteria in general practice are modified from The European Position Paper on Rhinosinusitis and Nasal Polyps: (1)

- 1) ARS (adults): sudden onset of 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
for <12 weeks.
- 2) ARS (children): sudden onset of two or more symptoms: nasal blockage/obstruction/congestion, or discoloured nasal discharge, or cough (daytime and night-time) for < 12 weeks.



- 3) ABRS is diagnosed by persistent symptoms or signs >10 days for at least three of the following features:
- Discoloured discharge (with unilateral predominance) and purulent secretion in cavum nasi
 - Severe local pain (with unilateral predominance)
 - Fever (>38°C)
 - 'Double sickening' (i.e. a deterioration after an initial milder phase of illness).

ARS is diagnosed clinically. Transillumination for opacity may be unreliable and limited only to maxillary and frontal sinuses. Otoscope and nasal speculum examination may show diffuse mucosal thickening with nasal discharge. (12) Imaging studies¹ are not necessary for uncomplicated viral or bacterial RS except for exclusion of alternative diagnoses. (9, 13) Nasopharyngeal and throat swabs correlate poorly with the actual pathogens. (2, 13). Sinus aspiration² is seldom performed nowadays except for cases with treatment failure. (14)

Observation versus antibiotics

For mild and uncomplicated ARS cases, a watchful waiting period followed by reassessment may be appropriate. For children, the period of observation is suggested to be 3 days. (15) Routine use of antibiotics to treat mild cases of ARS in primary care does not prevent the development of complications. A Cochrane review found that out of 100 patients only 5 will have faster cure between days 7 to 14, with a number needed to benefit of 18. (3) Empirical antibiotic treatment should be reserved for cases with features suggestive of bacterial infections (ABRS) and should be started as soon as the diagnosis is established clinically. (14)

Recommended choices of antibiotics

Tables 1&2 describe the recommended antibiotics for treatment of ABRS in adult and paediatric patients. First-line antibiotic is usually amoxicillin or amoxicillin-clavulanate. The latter is a beta-lactam-beta-lactamase inhibitor combination antibiotic and is therefore active against beta-lactamase-producing bacteria, including most of *H. influenzae*, *M. catarrhalis* and methicillin-sensitive *S. aureus*. It has no added advantage against *S. pneumoniae*, whose beta-lactam resistance does not rely on enzyme production. Ceftriaxone is an alternative for more severe cases or if response is poor. However it requires parenteral route of administration.

For patients with type 1 penicillin allergy, antibiotics belonging to a completely different class should be used, such as doxycycline, levofloxacin or moxifloxacin. These are in general contraindicated in paediatric populations and should only be used if benefit outweighs harm. Cultures results are preferably available for justification. For certain antibiotics e.g. macrolides (clarithromycin, azithromycin), follow-up after an initial course of treatment is recommended due to relatively high rate of antibiotic resistance.

Duration of antibiotic treatment for adults is usually cited to be 5-10 days. For children, a longer course of 10-14 days is recommended as the evidence for short course treatment in paediatrics is not conclusive. (9, 14) In one meta-analysis, short course of treatment did not differ from long course in terms of efficacy and relapse rate while associated with less adverse effects. Referral to specialist and consultation with clinical microbiologist/ infectious diseases specialist is advised for complicated cases

¹ Plain x-rays have poor sensitivity and specificity, while sinusitis features on CTs are non-specific. However, a negative CT scan can exclude the diagnosis of RS. MRI is very sensitive for soft tissue abnormalities and detection of intracranial complications. It is less readily available and usually requires sedation for children. (2, 13)

² Aspirated fluid should be sent for Gram stain, aerobic and anaerobic culture, and antimicrobial susceptibility testing. Sinus aspiration with a culture that yields $\geq 10^4$ colony-forming units/mL of a significant pathogen is the reference standard for diagnosis of ABRS. Sinus aspiration is an invasive procedure to be performed by specialist.



e.g. poor response to treatment or immunocompromised hosts. (14) Patients should be advised that the average course of ARS lasts for about 2½ weeks. (16)

Adjunctive measures

Normal saline irrigation of the nasal cavity can be safely recommended with possible benefits for relieving symptoms and reducing the use of symptomatic medications. (17) Intranasal corticosteroid are only marginally useful with symptomatic relief occurring late and should be considered only for patients >12 years with persistent symptoms and a history of allergic rhinitis. Oral decongestants should be used with caution in patients with cardiovascular disease and angle-closure glaucoma. Antihistamines may paradoxically worsen congestion by drying the mucosa and should be used only in patients with a history of allergy. Paracetamol or NSAIDs are useful for symptom relief. (18, 19, 20)

Table 1. Antibiotics recommendation for treatment of Acute Bacterial Rhinosinusitis in adults (9, 15, 18, 21-23)

Drug (Route)	Dosage and Frequency, Adults (Usual)	Duration (Usual)	Remarks
First line			
Amoxicillin (oral)	500 or 1000 mg three times daily	5-10 days	High dose to cover <i>S. pneumoniae</i> with reduced penicillin susceptibility.*
Amoxicillin-clavulanate or other BLBLIs# (oral)	375mg (250mg/125mg) three times daily or 1g (875mg/125mg) twice daily	5-10 days	
Second line			
Levofloxacin † (oral)	500mg once daily	5-10 days	For severe (type 1) penicillin allergy (rare). Contraindicated in paediatric population.
Doxycycline (oral)	100mg twice daily or 200mg once daily	5-10 days	For severe (type 1) penicillin allergy (rare). Contraindicated in children < 8 years old.
Azithromycin (oral)	500mg once daily for 3 days or 500mg once daily for 1 day, then 250mg once daily for 4 days	3-5 days	For severe (type 1) penicillin allergy (rare). High rate of resistance in Hong Kong, follow up after initial course of antibiotic recommended.
Metronidazole (oral)	400mg three times daily	5-10 days	As combination therapy with other antibiotics (except BLBLIs#) if anaerobes are suspected (e.g. in odontogenic infections).



Table 2. Antibiotics recommendation for treatment of Acute Bacterial Rhinosinusitis in children (9, 15, 18-19, 21-23)

Drug (Route)	Dosage and Frequency, Children (Usual)	Duration (Usual)	Remarks
First line			
Amoxicillin (oral)	45 mg/kg/day or 90 mg/kg/day (maximum: 3000 mg/day) in divided doses every 8 or 12 hours	10-14 days	High dose to cover <i>S. pneumoniae</i> with reduced penicillin susceptibility. [^]
Amoxicillin-clavulanate or other BLBLIs# (oral)	Children < 40 kg: 20mg (amoxicillin)/5mg (clavulanate)/kg/day to 60mg (amoxicillin) /15mg (clavulanate)/kg/day in divided doses every 8 hours ##	10-14 days	
Second line			
Cefpodoxime (oral)	Infants ≥2 months to Children <12 years of age: Oral: 5 mg/kg/dose (maximum: 200 mg/dose) every 12 hours Children ≥12 years of age and Adolescents: refer to adult dosing	10-14 days	For non-type 1 penicillin allergy. Certain <i>S. pneumoniae</i> isolates may not be reliably covered by oral cephalosporins in the local setting.
Cefuroxime (oral)	Infants >3 months of age and Children: 15 mg/kg/dose (maximum : 250 mg/dose) every 12 hours	10-14 days	
Clarithromycin (oral)	Children 6 months to 12 years of age: 7.5 mg/kg every 12 hours (maximum: 500 mg/dose)	10-14 days	For severe (type 1) penicillin allergy (rare). High rate of resistance in Hong Kong, follow up after initial course of antibiotic recommended.
Azithromycin (oral)	For children <15 kg (<3 years): 10 mg/kg once daily For children ≥ 15 kg: 15-25 kg (3-7 years): 200 mg once daily; 26-35 kg (8-11 years): 300 mg once daily; 36-45 kg (12-14 years): 400 mg once daily; Over 45 kg: Dose as per adults	3-5 days	
Metronidazole (oral)	30 mg/kg/day in divided doses every 8 hours (maximum: 2000mg per day)	10-14 days	As combination therapy with other antibiotics (except BLBLIs#) if anaerobes are suspected (e.g. in odontogenic infections).

* Risk factors for drug-resistant *S. pneumoniae* (DRSP) in adults are age >65 years, beta-lactam therapy within past 3 months, alcoholism, multiple medical comorbidities, exposure to a child in a daycare centre.

[^] Risk factors for drug-resistant *S. pneumoniae* (DRSP) in children are: Age < 2 years, beta-lactam therapy within past 3 months, daycare attendance and unimmunized with pneumococcal conjugate vaccine.

[†]Due to risk of serious side effects involving tendons, muscles, joints, nerves and the central nervous system, fluoroquinolones should be reserved for use in patients who have no alternative treatment options. (24)

Beta-lactam-beta-lactamase inhibitor combinations e.g. ampicillin-sulbactam.

No clinical data are available on doses higher than 40 mg/10 mg/kg per day in children under 2 years.



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