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Child with a chronic wet cough: bronchiectasis




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Overview

- Cough Background
- Natural History of symptoms
- Protracted bacterial Bronchitis
- Diagnosis
- Microbiology
- Treatment of exacerbations
- Long term management
- Future directions

2

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Reference Pediatric Pulmonology 51:225-242 (2016)


— State of the Art —

Protracted Bacterial Bronchitis: The Last Decade and the Road Ahead

Anne B. Chang, MD,^{1,2,3*} John W. Upham, MD,¹ Brent Masters, MD,^{2,3} Gregory R. Redding, MD,³
 Peter G. Gibson, MD,^{4,5} Julie M. Marchant, MD,^{2,3} and Keith Grimwood, MD,^{6*}

Management of Children With Chronic Wet Cough and Protracted Bacterial Bronchitis
 CHEST Guideline and Expert Panel Report


Anne B. Chang, MBBS, PhD, MRH; John J. Oppenheimer, MD; Miles M. Weinberger, MD, FCCP; Bruce K. Rubin, MD; Cameron C. Grant, MBChB, PhD; Kelly Weir, BSpThy, MSpPath, PhD, CPSP; and Richard S. Irwin, MD, Master FCCP; on behalf of the CHEST Expert Cough Panel

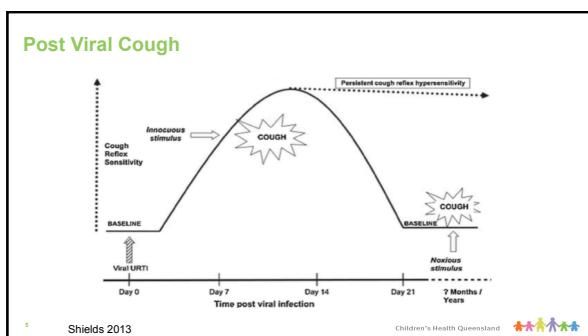
newsland 

Cough

- Important protective reflex
- Well children can cough up to 11 times/day
- Chronic cough
 - Prevent aspiration
 - Chronic airway irritation/inflammation
 - Chronic airway hypersecretion
 - Extra-respiratory cause
- Chronic cough course
 - Variable resolution
 - Medium to long term morbidity


4

Munyard 1996, Shields 2013 Children's Health Queensland 



Chronic Wet Cough

- Persistent Bacterial Bronchitis
- Cystic Fibrosis
- Immune Deficiencies
- Primary Ciliary Disorders
- Recurrent pulmonary aspiration
- Retained Inhaled foreign body
- Congenital lesions – operated/non-operated
- Neurodevelopmental/Neuromuscular

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Protracted Bacterial Bronchitis

TABLE 1—Diagnostic Criteria for Protracted Bacterial Bronchitis

1. Original microbiologic-based case definition⁹ (also termed PBB-micro)
 - i. Presence of chronic wet cough (>4 weeks)
 - ii. Lower airway infection (recognized respiratory bacterial pathogens growing in sputum or at BAL at density of a single bacterial species $\geq 10^6$ colony-forming units/ml)
 - iii. Cough resolved following a 2-week course of an appropriate oral antibiotic (usually amoxicillin-clavulanate)
2. Modified clinical-based case definition¹⁰ (also termed PBB-clinical)
 - i. Presence of chronic wet cough (>4 weeks)
 - ii. Absence of symptoms or signs of other causes of wet or productive cough¹
 - iii. Cough resolved following a 2-week course of an appropriate oral antibiotic (usually amoxicillin-clavulanate)
3. PBB-extended = PBB-clinical or PBB-micro, but cough resolves only after 4 weeks of antibiotics
4. Recurrent PBB = recurrent episodes (>3 per year) of PBB

Chang 2016

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Protracted Bacterial Bronchitis

- >4 weeks of cough
 - Initially managed as asthma
 - Shorter courses of antibiotics does not seem to clear
 - 2-4 weeks of Abs needed
- Microbiology
 - *Haemophilus influenzae* 40%
 - *Streptococcus pneumoniae* 20%
 - *Staphylococcus aureus* 7.6%
 - *Moraxella catarrhalis* 8.5%
 - *Pseudomonas aeruginosa* 7.9%

Pizzutto 2017

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Resolution

- A positive response to a full course of an appropriate antibiotic and the child returning to completely good health confirms the diagnosis of PBB and no further investigations is likely to be needed.
- Stepwise approach to further investigation

9

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Further investigations

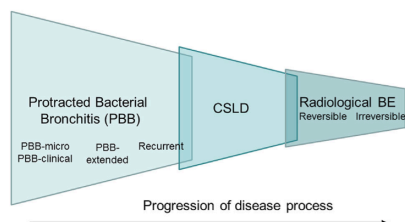
- Sweat test
- Cf genotype
- Immune function tests
- Bronchoscopy & lavage
- CT scan
- Barium Swallow
- Swallow assessment with videofluoroscopy

10

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Progression



11

Chang 2016

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Bronchiectasis - Management principles

1. Early diagnosis
2. Identifying underlying causes and associated conditions
3. Diagnosis, treatment and prevention of acute exacerbations
4. Improving quality of life
5. Prevent lung function decline and complications of bronchiectasis

Goyal 2016

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Diagnosis

- Early diagnosis is important
 - progressive, long term morbidity
 - early bronchiectasis in paediatrics can be reversible
- When to consider investigating for BE
 - chronic wet cough in children
 - red flag signs – cough pointers
- Investigations

Gaillard et al. Radiol 2003
 Haidopoulou et al. Pediatr Pulmonol 2009
 TSANZ Guidelines 2015
 Goyal et al. Arch Dis Child 2015
 Chang, Chest 2017

TABLE 1 Extended List of Cough Pointers (Modified From Previous Articles)

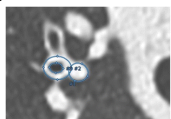
Systemic	Pulmonary
<ul style="list-style-type: none"> • Cardiac abnormalities • Digital clubbing • Failure to thrive • Medications or drugs associated with chronic cough (angiotensin-converting enzyme inhibitors, illicit drug use) • Neurodevelopmental abnormality • Fever • Immunodeficiency (primary or secondary) • Feeding difficulties • History of contacts (eg, TB) 	<ul style="list-style-type: none"> • Chest pain • Daily moist or productive cough • Hemoptysis • Abnormal cough characteristics (brassy, plastic bronchitis, paroxysmal wheezy without posttussive vomiting, stridulous cough from birth) • Recurrent pneumonia • Hypoxa/cyanosis • History of previous lung disease or predisposing causes (eg, neonatal lung disease, foreign body aspiration) • Exertional dyspnea • Dyspnea at rest or tachypnea • Chest wall deformity • Auscultatory findings (eg, stridor, wheeze, crackles) • Chest radiograph abnormalities • Pulmonary function test abnormalities

Cough Pointers

Chang et al, *Chest* Guideline & Expert Panel Report, 2017

Radiology

- Bronchial wall dilation is the characteristic feature of bronchiectasis.
- The BA ratio
 - increases with age in adults
 - lower threshold is recommended in children



BTS guidelines Thorax 2010
 Kapur et al. Chest 2011
 Kuo et al. Chest 2017

Viruses

- Respiratory viruses were identified in 48% of exacerbations in 69 Queensland children with bronchiectasis
- Detected in the BAL of 44% of 68 clinically stable children
- Rhinovirus most common

Pizzutto et al. Plos one 2015
 Kapur et al. Arch Dis Child. 2014

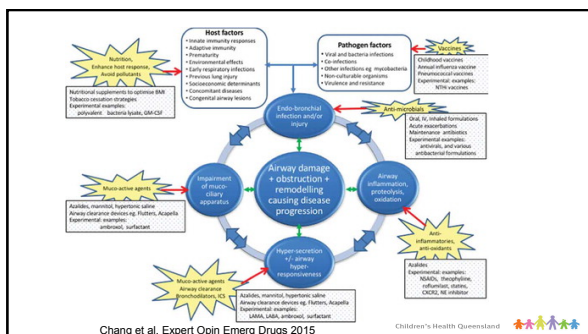
Exacerbations

- Important
 - Independent risk factor for lung function decline
 - Huge economic burden
 - Associated with poor quality of life
- Definition
 - New wet cough for more than 3 days
 - Increase in sputum volume
 - Change in sputum colour

Kapur et al. Pediatr Pulmonol 2012
 Kapur et al. Chest 2012

Treatment Options

- Antibiotics
- Airway clearance therapy
- Muco-active agents
- Asthma therapies
 - Steroids/ bronchodilators- combinations
- Nutrition
- Vaccines
- Prophylactic antibiotics



Antibiotics

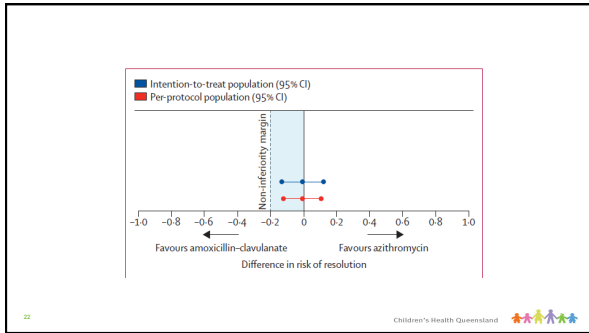
- Cornerstone of therapy
- Treatment paradigm IV if not responding to oral abs
- Oral vs IV antibiotic efficacy studies not available
- Equivalence between antibiotics established
- Length of treatment to extend of 4 weeks also shown to improve and clear symptoms
- If oral antibiotics used, clinical review required to assess response

Chang, Chest 2017

BEST -2 Study

Amoxicillin-clavulanate versus azithromycin for respiratory exacerbations in children with bronchiectasis (BEST-2): a multicentre, double-blind, non-inferiority, randomised controlled trial

Vikas Goyal, Keith Grimwood, Catherine A Byrne, Peter S Morris, Tibrett Masters, Robert S Ware, Gabrielle B McCallum, Michael J Brink, Julie M Marchant, Peter von Asperen, Kerry Ann F O'Grady, Anita Champion, Helen M Buntain, Helen Petrek, Paul J Torzillo, Anne B Chang



Pseudomonas eradication

- Nil consistency in managing *Pseudomonas aeruginosa*
- 14-day IV ceftazidime & tobramycin, followed by nebulised tobramycin or placebo for 3 months
 - 54.5 % free of *P. aeruginosa* at 12 months vs 29.4% placebo.
- Retrospective studies:
 - 64 patients who had additional 3 months of colistin
 - eradication rate at 6 months was 52% (n=33), and 70% (n=23) at 12 months
 - chronic *P. aeruginosa* infection- addition of neb tobramycin to high-dose oral ciprofloxacin for 14 days –better microbial clearance at day 14

Orriso et al Respiration, 2015
Vallières et al. ERJ 2017
Bilton et al. Chest 2006

Hyperosmolar agents

- 6% hypertonic vs isotonic saline for 12 months in 40 adult patients
 - exacerbation rate similar
 - significant improvements in QOL in both groups
- 7% HS in 28 adult patients for 3 months
 - improved FEV1, QOL,
 - decreased annualised antibiotic
- Dry powder mannitol vs placebo in 461 adult patients for 12 months
 - No difference in number of exacerbations

Kellet et al. Respir Med. 2011
Nicolson et al. Respir Med. 2012
Bilton et al. Thorax 2014

Bronchodilators

- No paediatric studies
- Many patients are wrongly diagnosed as asthma before a diagnosis of bronchiectasis is made
- Wheeze can be a feature of bronchiectasis exacerbation
- In the absence of a confirmed diagnosis of asthma, not recommended

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Vaccines

- Role of Influenza and Pneumococcal vaccines have not been systematically studied
- Potential vaccines
 - PsA vaccine
 - NTHi vaccine
 - 10-valent pneumococcal-H.influenzae protein D conjugate vaccine in children with chronic suppurative lung disease and bronchiectasis
 - preliminary data shows reduction in antibiotic treated exacerbations

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Treatment Options

- Antibiotics
- Airway clearance therapy
- Muco-active agents
- Asthma therapies
 - Steroids/ bronchodilators- combinations
- Nutrition
- Vaccines
- Prophylactic antibiotics

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Monitoring and on-going care

- Clinical review
- Lung function
- Microbiology
- Individualized management plans
- Multidisciplinary approach

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Registries

- American bronchiectasis registry
- EMBARC
- NZ bronchiectasis registry
- Australian Bronchiectasis registry

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Summary

- Management principles are similar to other chronic lung diseases
- Specific updates on management
- Antimicrobial therapy
 - Acute
 - Long term
- Airway clearance therapy
- Other potential therapies
- Treatment evidence from CF not readily applies to bronchiectasis
- Ongoing research is required

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