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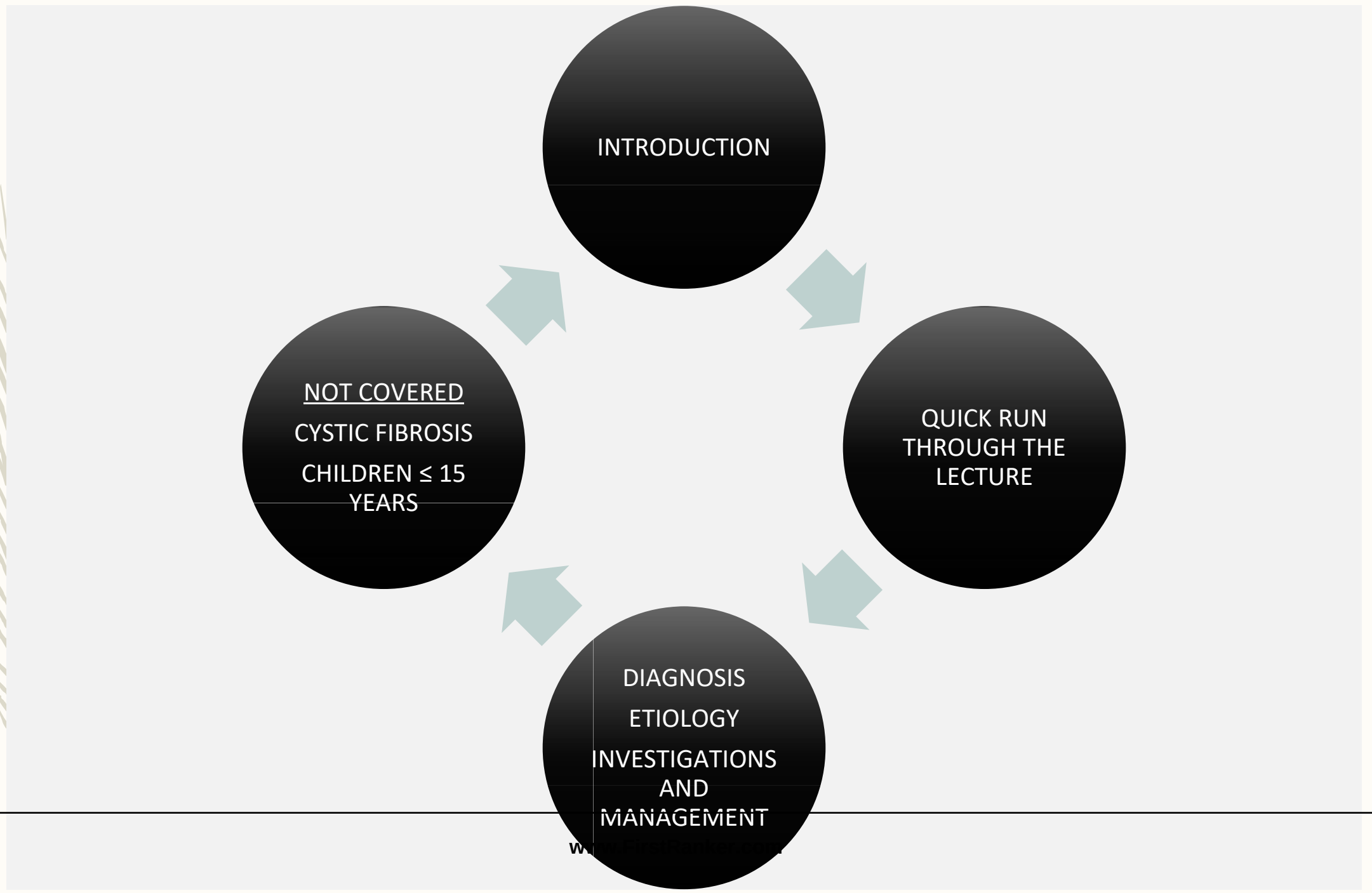
APPROACH TO BRONCHIECTASIS & LUNG ABSCESS



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LEARNING OBJECTIVES

- Definition
- Etiology
- Pathogenesis
- Clinical manifestations
- Diagnosis
- Treatment

CASE 1

- A 42-year-old man, gardener
- Long history of respiratory problems starting in early childhood.
- Previously diagnosed as asthma.
- Frequent absence from work due to “recurrent chest infections”.
- Unaware of any neonatal issues but believes that he was born at home without complications and is unsure of any previous tests he has had as he is now estranged from his parents.
- Has a cousin with a “lung disease”.
- Married but has “no kids”

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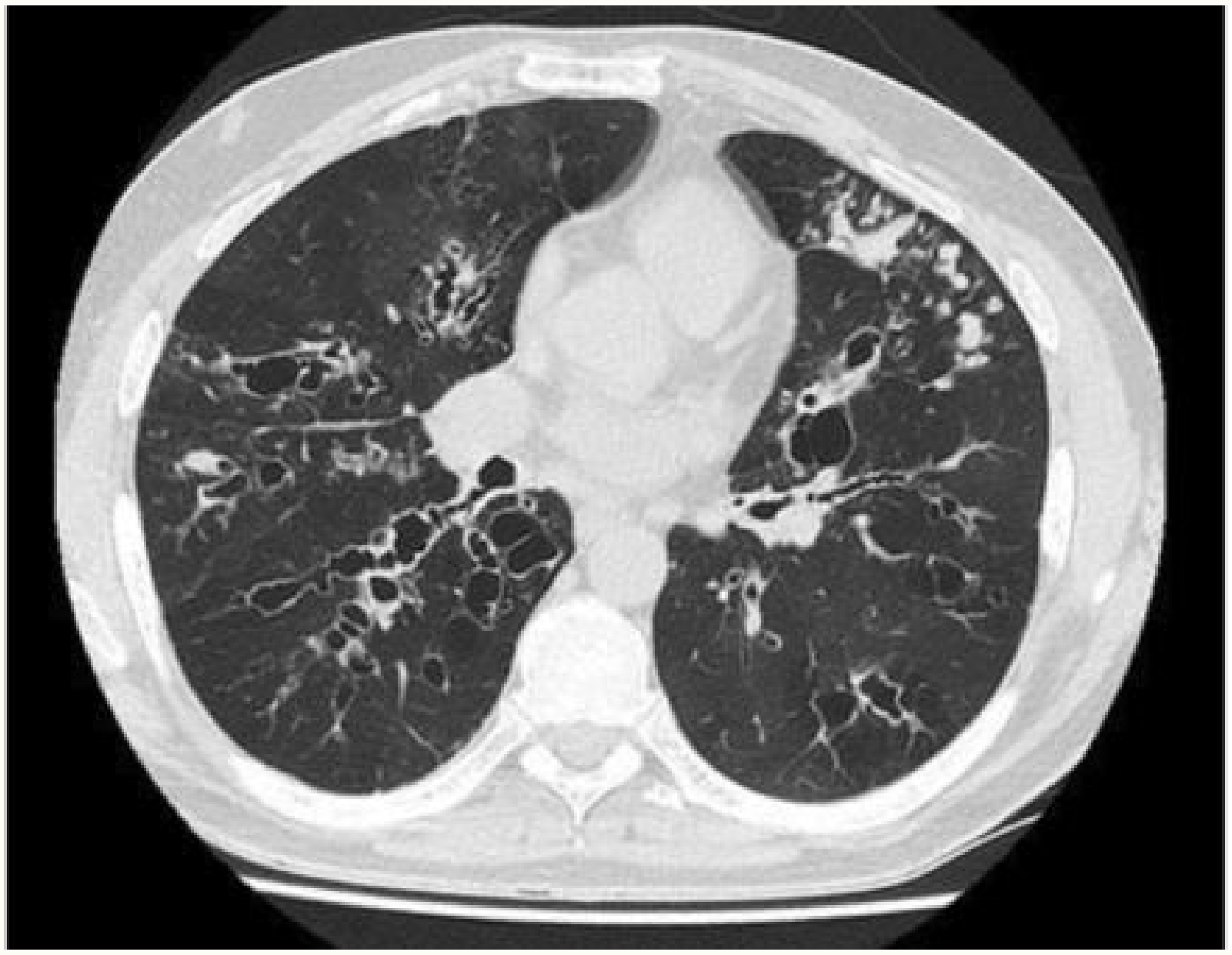

INVESTIGATIONS

- Sputum culture: P. aeruginosa
- Sweat chloride = 73 meq/liter
- Cystic fibrosis genetics: genotype was F508del/R117H

- **CYSTIC FIBROSIS**: Multisystem disorder caused by mutations in the gene that encodes the CF transmembrane conductance regulator (CFTR) protein, a chloride channel expressed in epithelial cells.
- More than 2000 CFTR mutations have been identified to date, but only the functional importance of a small number is known to cause the disease

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HRCT THORAX

- An upper lobe predominant distribution of cylindrical, cystic and varicose bronchiectasis associated with airway wall thickening, mucus plugging and parenchymal opacities on a HRCT scan should raise the suspicion of CF disease.
- The presence of nasal polyposis and/or chronic rhinosinusitis, recurrent pancreatitis, malabsorption, diabetes, osteoporosis and male infertility are other typical features of CF

DIAGNOSIS

Guidelines published by the Cystic Fibrosis Foundation in the USA allows diagnosis if:

1. Clinical presentation of the disease and evidence of biochemical and genetic markers of CFTR dysfunction.
2. Clinical features of the disease with concentration of chloride >60 $mmol \cdot L^{-1}$ at the sweat test or a concentration in the intermediate range (30–59 $mmol \cdot L^{-1}$) but two disease-causing CFTR mutations.
3. CFTR genotype is undefined: CFTR physiologic tests, such as nasal potential difference and intestinal current measurement, should be performed.

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MANAGEMENT

1. CFTR modulator therapies
2. Airway clearing techniques
3. Chest physical therapy
4. Humidification with sterile water or normal saline to facilitate airway clearance
5. Antibiotics
6. Mucus thinners
7. Lung transplantation

CASE 2

- 45-year-old farmer with asthma since childhood.
- Complaints: Decline in his exercise tolerance and an increase in cough which has become productive of purulent sputum with occasional thick/solid components.
- Respiratory exacerbations not responding well to standard steroid and antibiotic treatment.
- He was noted to have variable pulmonary infiltrates on chest radiographs during these episodes

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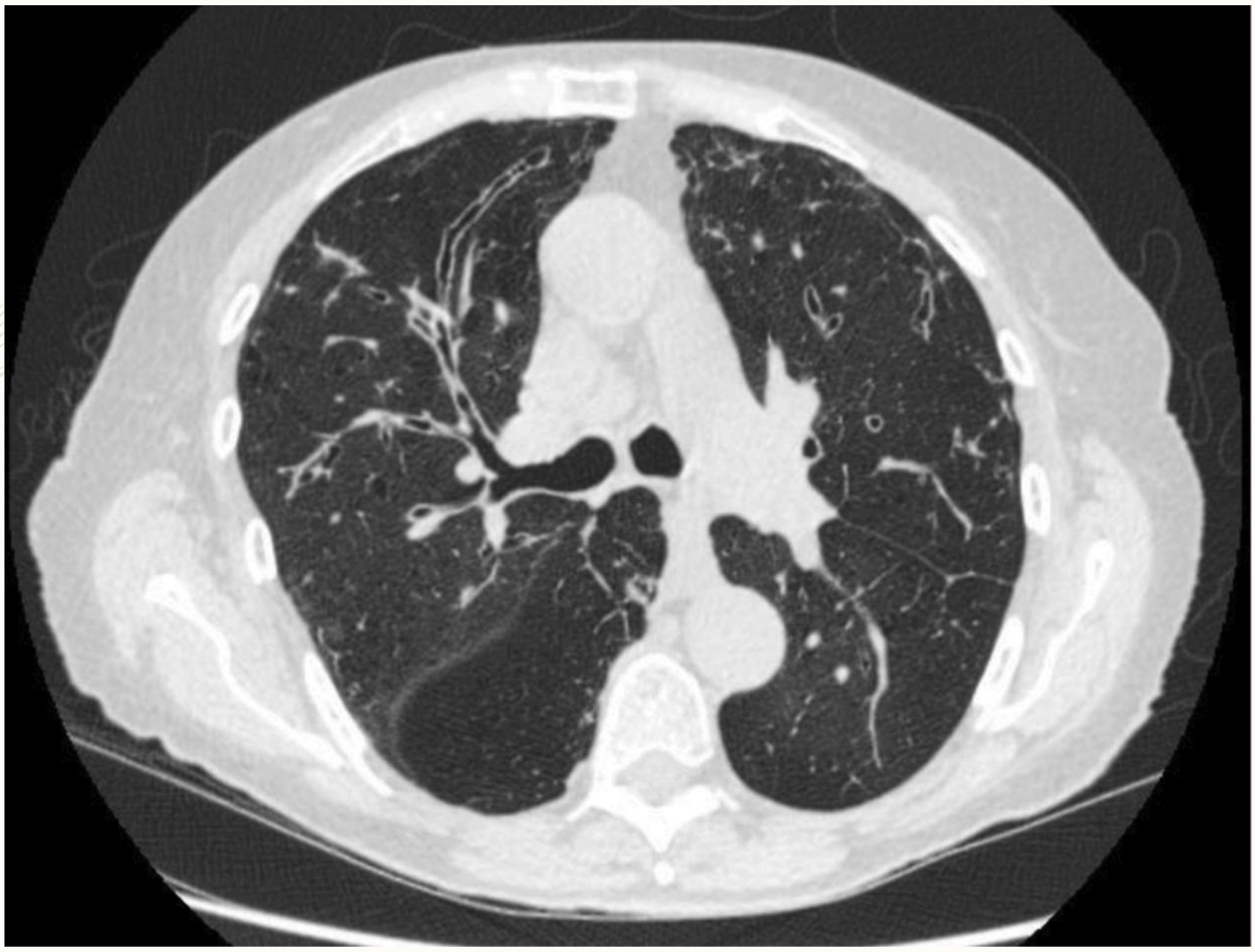

INVSETIGATIONS

- Marked peripheral blood eosinophilia
- Total IgE > 1000 IU/ ml
- Aspergillus specific IgE > O.35

ABPA: ABPA is an inflammatory disease caused by hypersensitivity to the ubiquitous fungus Aspergillus fumigatus

- ABPA occurs most commonly in patients with asthma and CF
- ABPA is the cause of 1–10% of cases of bronchiectasis
- Most ABPA cases occur in the third and fourth decade without a sex predilection.

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DIAGNOSIS

- Long standing uncontrolled asthma/ Cystic fibrosis
- Brownish sputum
- Peripheral eosinophilia > 500/ mm3
- Total IgE > 1000 IU/ ml
- Specific IgE for A. fumigatus > 0.35

HRCT thorax:

- Central bronchiectasis
- High attenuation mucus
- Finger in glove/ TIB
- Tram track
- Mosaic attenuation

MANAGEMENT

1. Corticosteroids
2. Antifungals
3. Airway clearing techniques
4. Chest physical therapy
5. Mucus thinners

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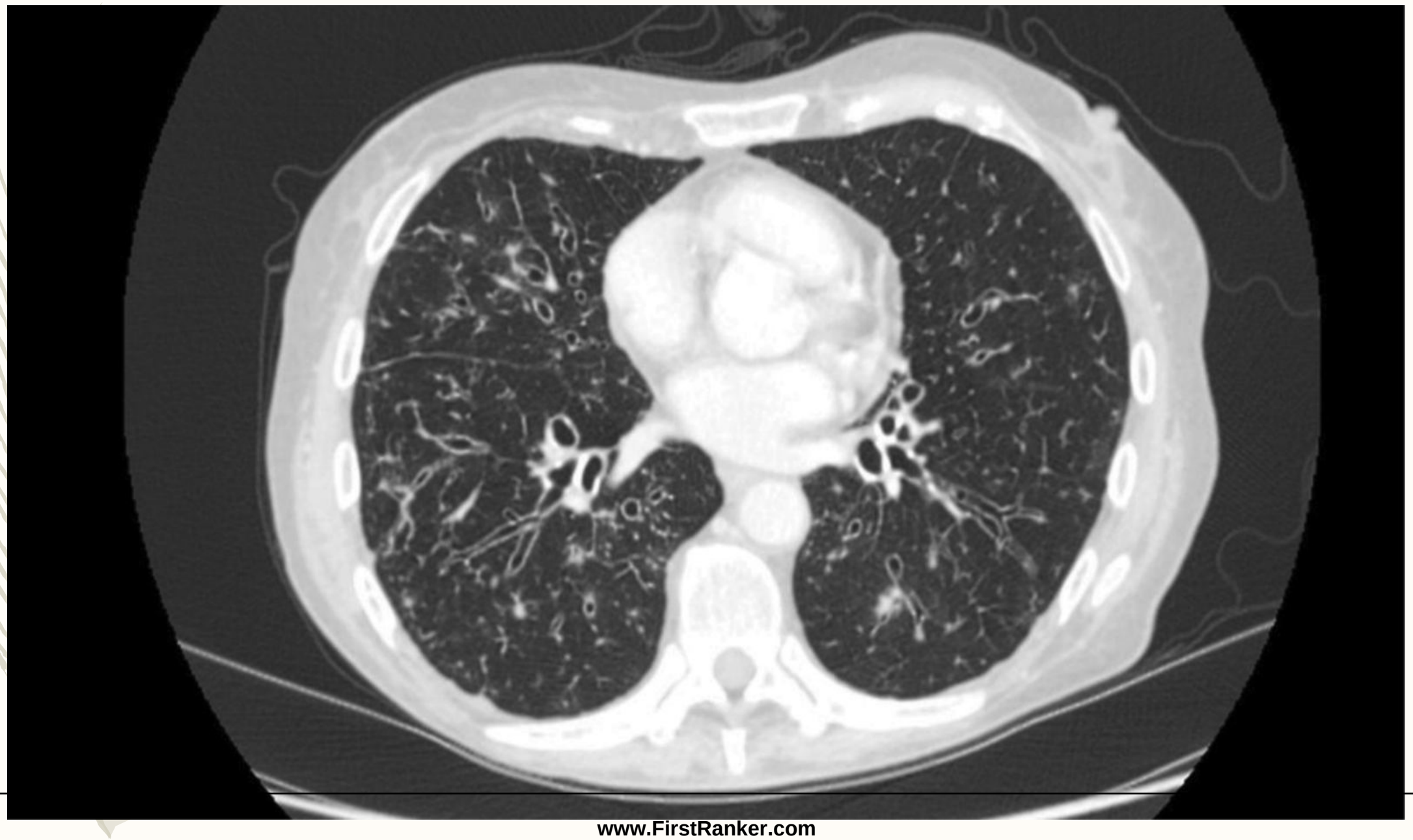
CASE 3

- 77-year-old retired librarian.
- Cough for many years with new symptoms of fatigue, weight loss and fever.
- A chest CT scan was performed looking for a possible occult malignancy and bronchiectasis was found.



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DIAGNOSIS

- HRCT thorax: cylindrical bronchiectasis and tree-in-bud pattern in middle and lower lobes
- Sputum for M. Tuberculosis: negative
- MGIT culture: MAC growth at 4 weeks
- Repeat MGIT: Positive for MAC
- Tests for immunodeficiency and ABPA: Negative

MANAGEMENT

1. Management of NTM as per the organism and clinical picture
2. Airway clearing techniques
3. Chest physical therapy
4. Mucus thinners

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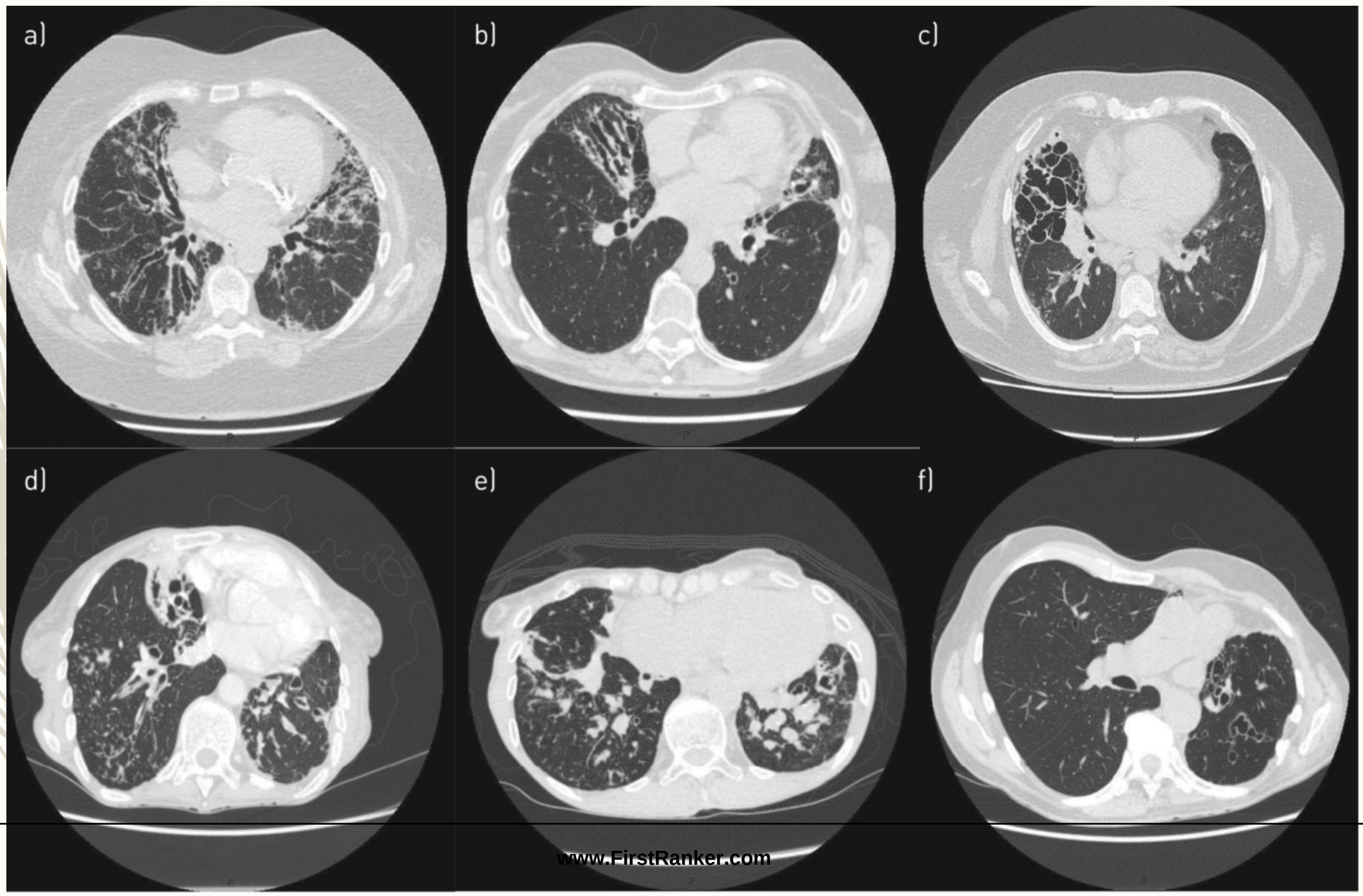
CASE 4

- A 66-year-old woman with established idiopathic bronchiectasis has had three to four exacerbations per year for the past 3 years despite performing daily chest physiotherapy.
- Produces large volumes of sputum daily despite performing the active cycle of breathing technique.
- Testing for NTM, ABPA and other complications were negative, but sputum shows persistent infection with *P. aeruginosa*.



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- One of the most common presentations of bronchiectasis
- Exacerbations are one of the most important manifestations of bronchiectasis and *P. aeruginosa* is the most frequent organism in severe bronchiectasis worldwide
- Cylindrical bronchiectasis is the most common morphological pattern identified on CT scans

MANAGEMENT

1. Review current airway clearance regime.
2. Repeat sputum microbiology and repeat testing for NTM, ABPA and ensuring the all possible treatable causes and comorbidities have been identified.
3. First-line recommendation for *P. aeruginosa* with frequent exacerbations is an inhaled antibiotic.

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ETIOLOGY

Category	Cause/notes	Clinical phenotype	Specific treatment
Post-infection	Viral, bacterial, fungal, mycobacteria (usually classified separately)	Past history of severe infection; classically unilobar bronchiectasis	No specific treatment
NTM	*M. avium* and *M. abscessus* most frequent	Middle-aged or elderly; females with low BMI; middle lobe and lingual nodular bronchiectasis; cavitation; tree-in-bud	Antibiotic treatment
Post-TB	*M. tuberculosis*	Upper lobe most frequently	No specific therapy
ABPA	Hypersensitivity to *A. fumigatus*	History of asthma (not universal); thick sputum; *S. aureus* in sputum; central bronchiectasis; fleeting infiltrates	Steroids±antifungals
COPD	Smoking, biomass exposure	Fixed airflow obstruction; smoking history; bilateral lower lobe; tubular bronchiectasis	No specific therapy
Asthma	Not universally accepted as a cause of bronchiectasis	Long history of asthma; frequent exacerbations; neutrophilic airway inflammation	Inhaled corticosteroids, biologics *e.g.* anti-IgE and anti-IL5

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Aspiration/inhalation	Foreign body aspiration, gastric contents aspiration, inhalation of corrosive substances	Lower lobe bronchiectasis	Speech and language therapy, fundoplication, removal of exacerbating drugs
Obstruction	Benign tumours, enlarged lymph nodes	Single lobe bronchiectasis	Removal of obstruction *via* bronchoscopy or thoracic surgery
Congenital defects of large airways	Marfan syndrome, Mounier-Kuhn syndrome (tracheobronchomegaly), Williams–Campbell syndrome (bronchial cartilage deficiency)	Specific features depending on the congenital defect	Dependant on the underlying disorder
AATD	Unopposed protease activity	Combined emphysema and bronchiectasis	Augmentation therapy is available in some countries
Yellow nail syndrome	Lymphatic obstruction	Dystrophic nails, pleural effusions, rhinosinusitis	Local treatment for nails *e.g.* vitamin-E, management of lymphoedema
Immunological defects	Primary: common variable immune deficiency, agammaglobulinemia, hyper-IgE syndrome; secondary: chemotherapy, immunosuppressant therapy, malignancy, HIV/AIDS	Varied clinical pattern depending on the underlying cause; patient may give a history of non-respiratory infections	Ig replacement, prophylactic antibiotics, treatment of underlying disorder, removal of iatrogenic immunosuppression
Young's syndrome	Cause not known	Bronchiectasis, rhinosinusitis and reduced fertility	See ciliary disorders below
PCD	Genetic	Middle lobe and lower lobe bronchiectasis; rhinosinusitis; middle ear infections; situs inversus in some cases	Recognition and treatment of associated problems (including rhinosinusitis, middle ear disease, infertility, ectopic pregnancy), genetic counselling, intensive airway clearance
Systemic inflammatory disease	Rheumatoid arthritis, sarcoidosis, systemic lupus erythematosus, Sjögren syndrome	Varied clinical pattern, often rapidly progressive	No specific treatment
Inflammatory bowel disease	Ulcerative colitis, Crohn's syndrome, coeliac disease	Varied clinical pattern often high sputum volumes and steroid responsive	Inhaled and systematic corticosteroids, treatment of the underlying condition
Adult CF	CFTR mutations	Upper lobe bronchiectasis; *P. aeruginosa* or *S. aureus* in sputum; non-respiratory manifestations	Specialist multidisciplinary care in adult CF centres, recognition and treatment of non-respiratory manifestations, CFTR modulator/corrector therapy
Diffuse panbronchiolitis	Idiopathic inflammatory disease	Mostly patients of Far Eastern ethnic origin	Macrolide antibiotics

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INVESTIGATIONS FOR CAUSE

IN ALL

- COMORBIDITIES AND RELEVANT PAST HISTORY
- FULL BLOOD COUNT/ SERUM TOTAL IGE/ SKIN PRICK TEST TO A. FUMIGATUS
- SERUM Ig G/ IgA/ IgM
- BASELINE SPECIFIC ANTIBODY LEVELS AGAINST CAPSULAR POLYSACCHRIDES OF STREPTOCOCCUS PNEUMONIAE

CLINICALLY STABLE

- SPUTUM CULTURE : ROUTINE AND MYCOBACTERIAL

CLINICALLY SUSPECT

- HIV
- TEST FOR CYSTIC FIBROSIS/ PCD/ GERD
- RA, ANTI CCP , ANCA, ANA
- ALPHA 1 AT
- BRONCHIAL ASPIRATION OR WASH

Hill A, Welham S, Sullivan A, Loebinger M. Updated BTS Adult Bronchiectasis Guideline 2018: a multidisciplinary approach to comprehensive care. Thorax. 2018;74(1):1-3.

STEPWISE MANAGEMENT

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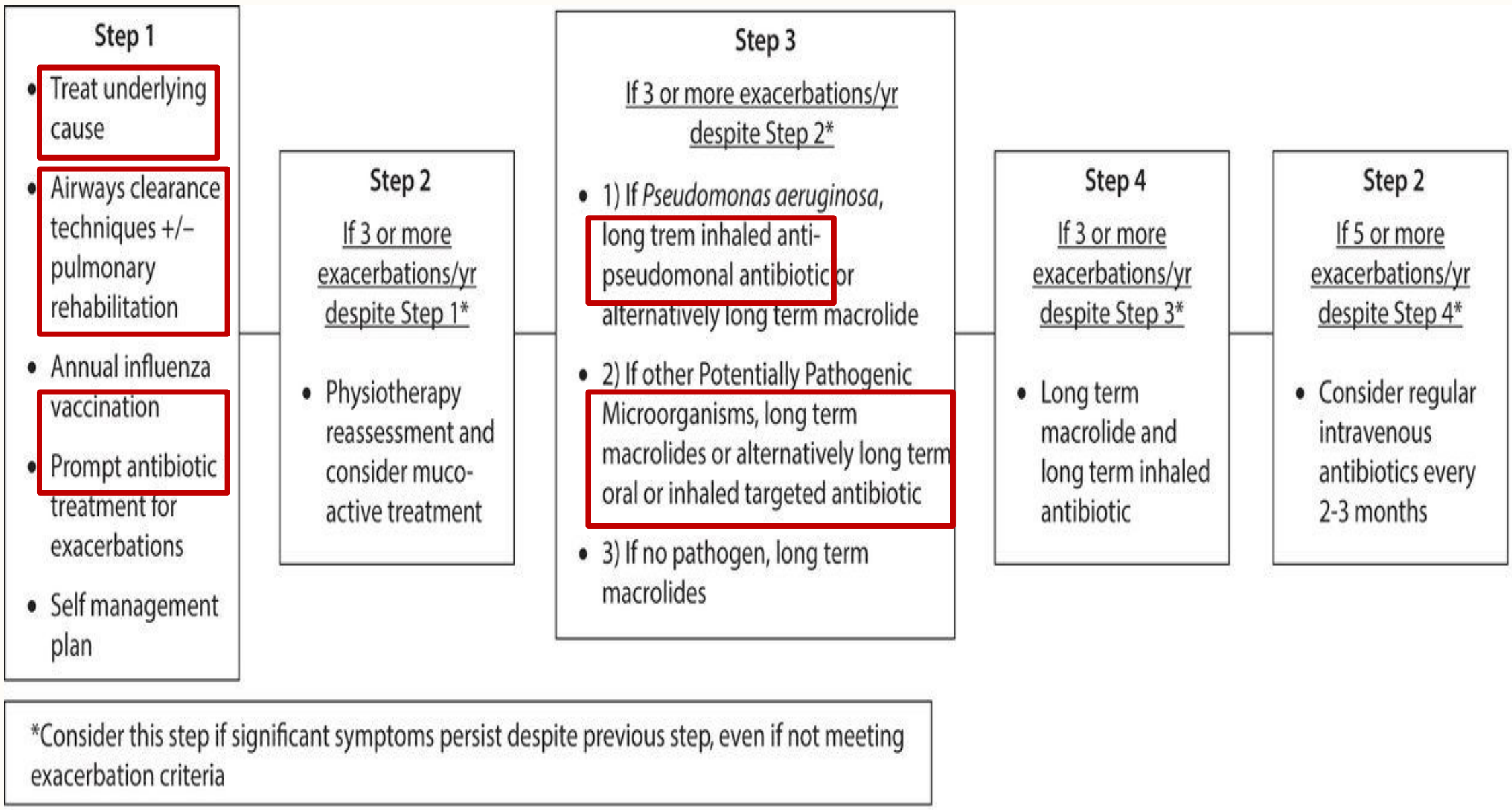

Antibiotics are used to treat exacerbations that present with an acute deterioration (usually over several days) with worsening local symtoms (cough, increased sputum volume or change of viscosity, increased sputum purulence with or without increasing wheeze, breathlessness, haemoptysis) and/or systemic upset. The flow diagram refers to three or more annual exacerbations.

THORAX

AIRWAY CLEARANCE

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Physiotherapy management-stepwise airway clearance.

STEP 1

Offer active cycle of breathing techniques (ACBT) to individuals with bronchiectasis.

Consider gravity assisted positioning (where not contraindicated) to enhance the effectiveness of an airway clearance technique. If contraindicated then modified postural drainage should be used.

Patients should be reviewed within 3 months.

This should include evaluation of patient reported effectiveness (ease of clearance/patient adherence).

The inclusion of gravity assisted positioning should be evaluated for its additional effectiveness.

STEP 2

If ACBT is not effective or the patients demonstrates poor adherence, oscillating Positive Expiratory Pressures + Forced Expiration Technique should be considered.

STEP 3

If airway clearance is not effective then nebulised Isotonic (0.9% saline) or Hypertonic Saline (3% saline and above) should be evaluated for its effectiveness pre-airway clearance (especially in patients with viscous secretions or there is evidence of sputum plugging)

Individuals should be advised to complete Airway Clearance in the following order, if prescribed:

– Bronchodilator

– Mucoactive treatment

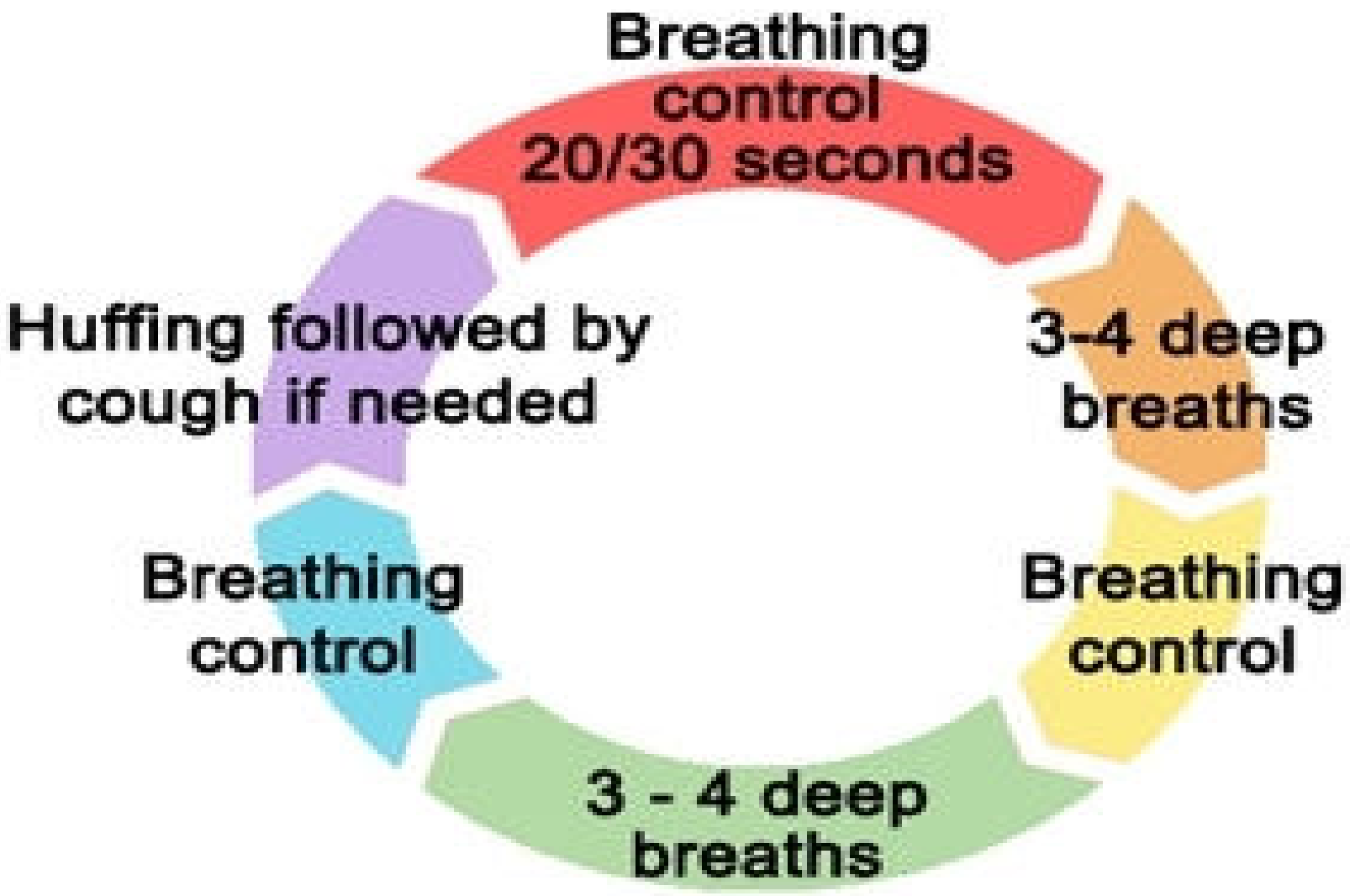
– Airway Clearance

– Nebulised antibiotic and/or inhaled steroids (if applicable)

ACBT: Active cycle of breathing techniques

THORAX

ACBT



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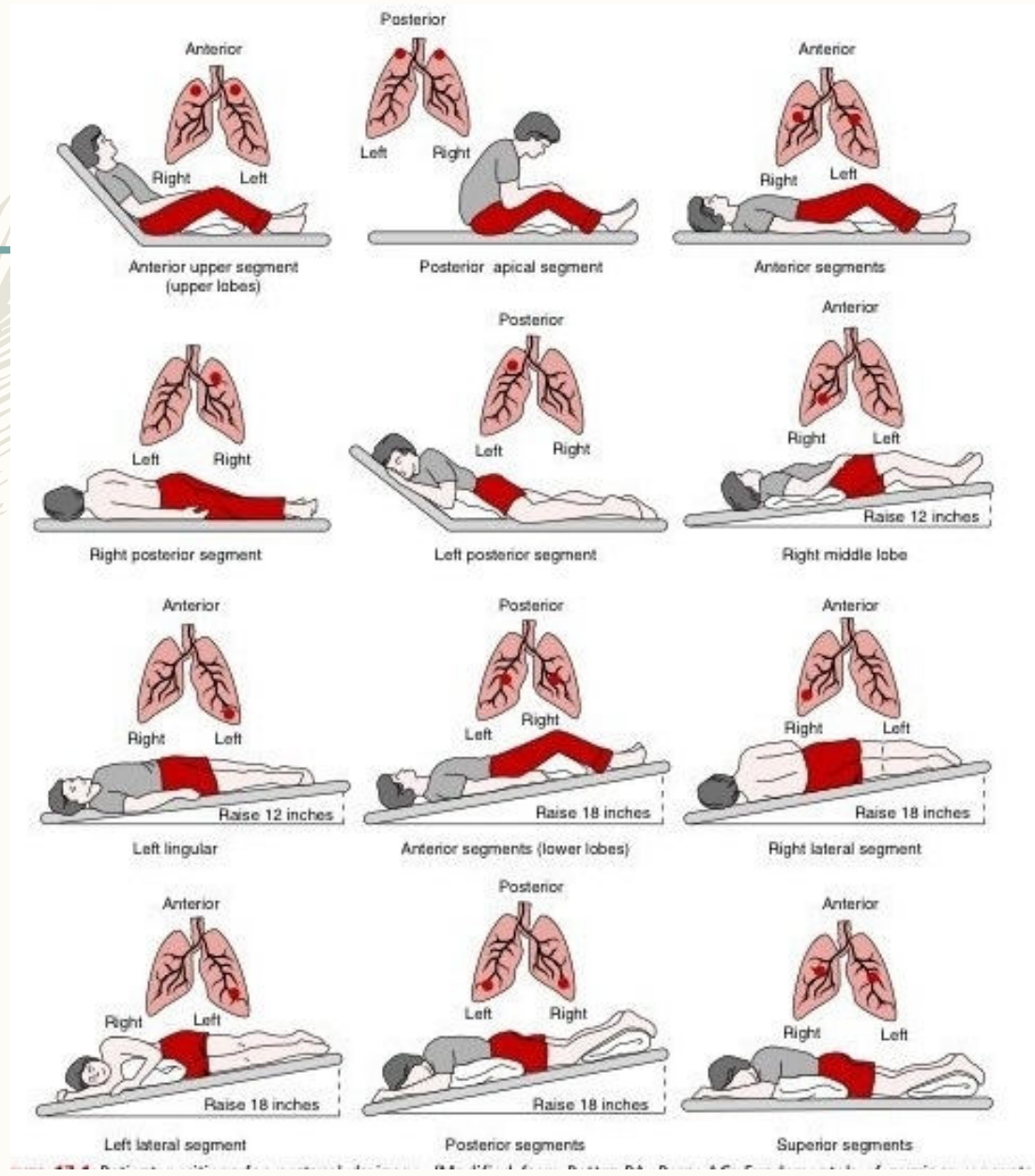
POSTURAL DRAINAGE



Airway clearance - exacerbations.

STEP 1	STEP 2	STEP 3
Increase airway clearance frequency. E.g.: from twice daily to three/four times daily.	Commence the use of mPD or PD if tolerated. For individuals with radiological changes, PD or mPD should be targeted appropriately.	Individuals with ongoing difficulty with airway clearance may benefit from the addition of other techniques. It is recommended that these should be commenced and evaluated in the following order (unless contraindicated) 1. Enhanced humidification / hydration of airways if secretions viscous (isotonic (0.9% saline) or hypertonic saline (3% saline and above)/humidification/increased fluid intake) 2. Manual Techniques 3. Positive pressure devices including Intermittent Positive Pressure Breathing (IPPB) or Non Invasive Ventilation (NIV) to be used during Airway Clearance

PD=postural drainage; mPD= modified postural drainage

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ANTIBIOTIC TREAMENT FOR EXACERBATION

Common organisms associated with acute exacerbation of bronchiectasis and suggested antimicrobial agents- adults

Organism	Recommended first line treatment	Length of treatment	Recommended second line treatment	Length of treatment
Streptococcus pneumoniae	Amoxicillin 500 mg Three times a day	14 days	Doxycycline 100 mg BD	14 days
Haemophilus influenzae- beta lactamase negative	Amoxicillin 500 mg Three times a day Or Amoxicillin 1G Three times a day Or Amoxicillin 3G BD	14 days	Doxycycline 100 mg BD Or Ciprofloxacin 500 mg or 750 mg BD Or Ceftriaxone 2G OD (IV)	14 days
Haemophilus influenzae- beta lactamase positive	Amoxicillin with clavulanic acid 625 one tablet Three times a day	14 days	Doxycycline 100 mg bd Or Ciprofloxacin 500 mg or 750 mg BD Or Ceftriaxone 2G OD (IV)	14 days
Moraxella catarrhalis	Amoxicillin with clavulanic acid 625 one tablet Three times a day	14 days	Clarithromycin 500 mg BD Or Doxycycline 100 mg BD Or Ciprofloxacin 500 mg or 750 mg BD	14 days
Staphylococcus aureus (MSSA)	Flucloxacillin 500 mg Four times a day	14 days	Clarithromycin 500 mg BD Or Doxycycline 100 mg BD Or Amoxicillin with clavulanic acid 625 one tablet Three times a day	14 days

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Staphylococcus aureus (MRSA) Oral preparations	Doxycycline 100 mg BD Rifampicin (<50 Kg) 450 mg OD Rifampicin (>50 Kg) 600 mg OD Trimethoprim 200 mg BD	14 days	Third line Linezolid 600 mg BD	14 days
Staphylococcus aureus (MRSA) Intravenous preparations	Vancomycin 1 gm BD* (monitor serum levels and adjust dose accordingly) or Teicoplanin 400 mg OD	14 days	Linezolid 600 mg BD	14 days
Coliforms for example, Klebsiella, enterobacter	Oral Ciprofloxacin 500 mg or 750 mg BD	14 days	Intravenous Ceftriaxone 2G OD	14 days
Pseudomonas aeruginosa	Oral Ciprofloxacin 500 mg bd (750 mg bd in more severe infections)	14 days	**Monotherapy:** Intravenous Ceftazidime 2G TDS or Piperacillin with tazobactam 4.5G TDS or Aztreonam 2G TDS or Meropenem 2G TDS **Combination therapy** The above can be combined with gentamicin or tobramycin or Colistin 2MU TDS (under 60 kg, 50 000–75 000 Units/kg daily in 3 divided doses) Patients can have an *in vivo* response despite in vitro resistance. Caution with aminoglycosides as highlighted below but also if previous adverse events, particularly previous ototoxicity/acute kidney injury due to aminoglycosides	14 days

WHAT IS THE ROLE OF SURGERY IN MANAGING BRONCHIECTASIS?

RECOMMENDATIONS

- Consider lung resection in patients with localized disease whose symptoms are not controlled by medical treatment optimized by a bronchiectasis specialist. (D)
- Offer multidisciplinary assessment, including a bronchiectasis physician, a thoracic surgeon and an experienced anesthetist, of suitability for surgery and pre-operative assessment of cardiopulmonary reserve post resection. (D)

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LUNG TRANSPLANTATION FOR BRONCHIECTASIS

Recommendations

- Consider transplant referral in bronchiectasis patients aged 65 years or less if the FEV_1 is <30% with significant clinical instability or if there is a rapid progressive respiratory deterioration despite optimal medical management. (D)
- Consider earlier transplant referral in bronchiectasis patients with poor lung function and the following additional factors: massive haemoptysis, severe secondary pulmonary hypertension, ICU admissions or respiratory failure (particularly if requiring NIV).(D)

LUNG ABSCESS

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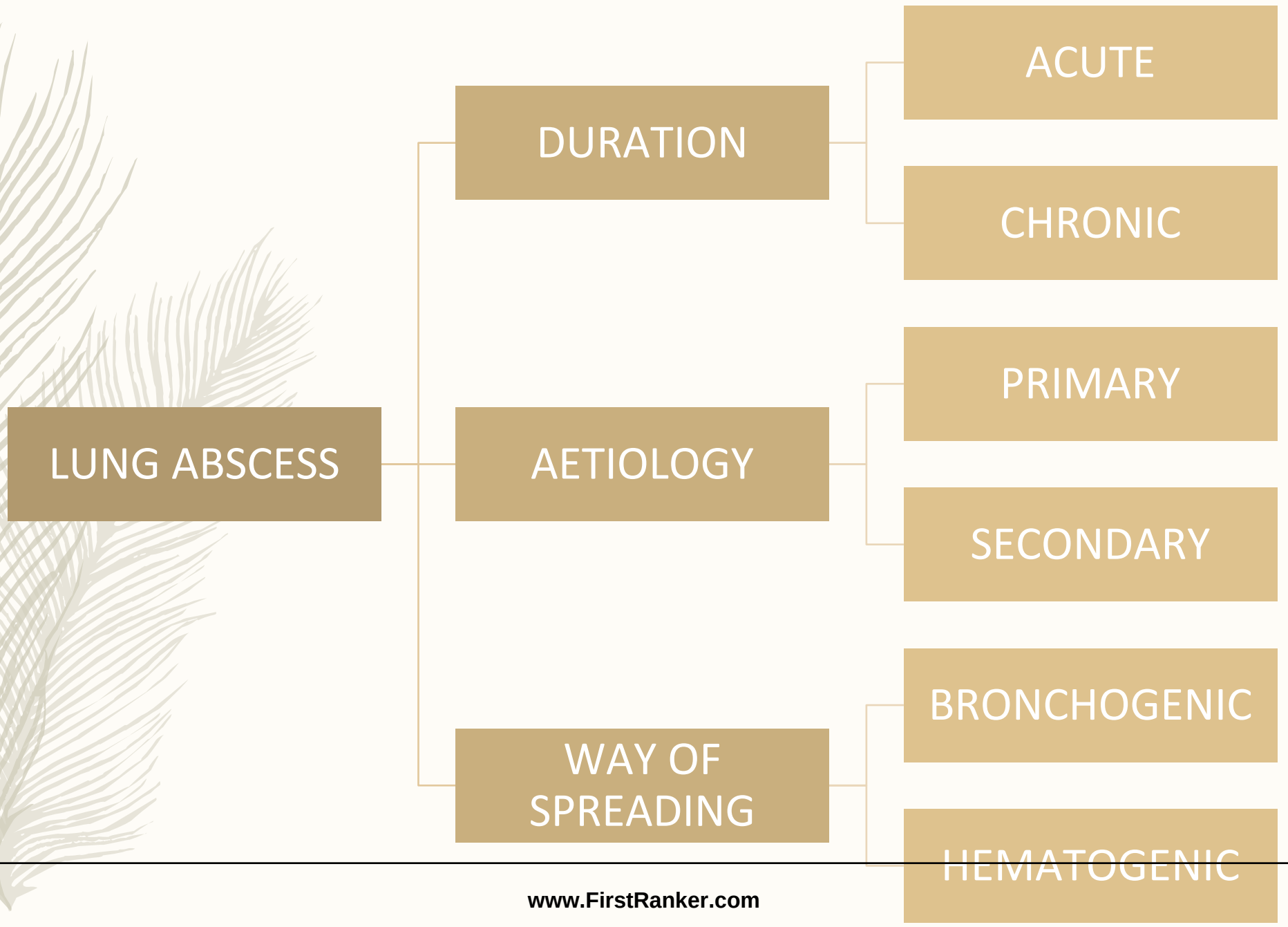
DEFINITION

Localized area of lung suppuration, leading to necrosis of the lung parenchyma with or without cavity formation.

Type of liquefactive necrosis of the lung tissue and formation of cavities (more than 2 cm) containing necrotic debris or fluid caused by microbial infection.



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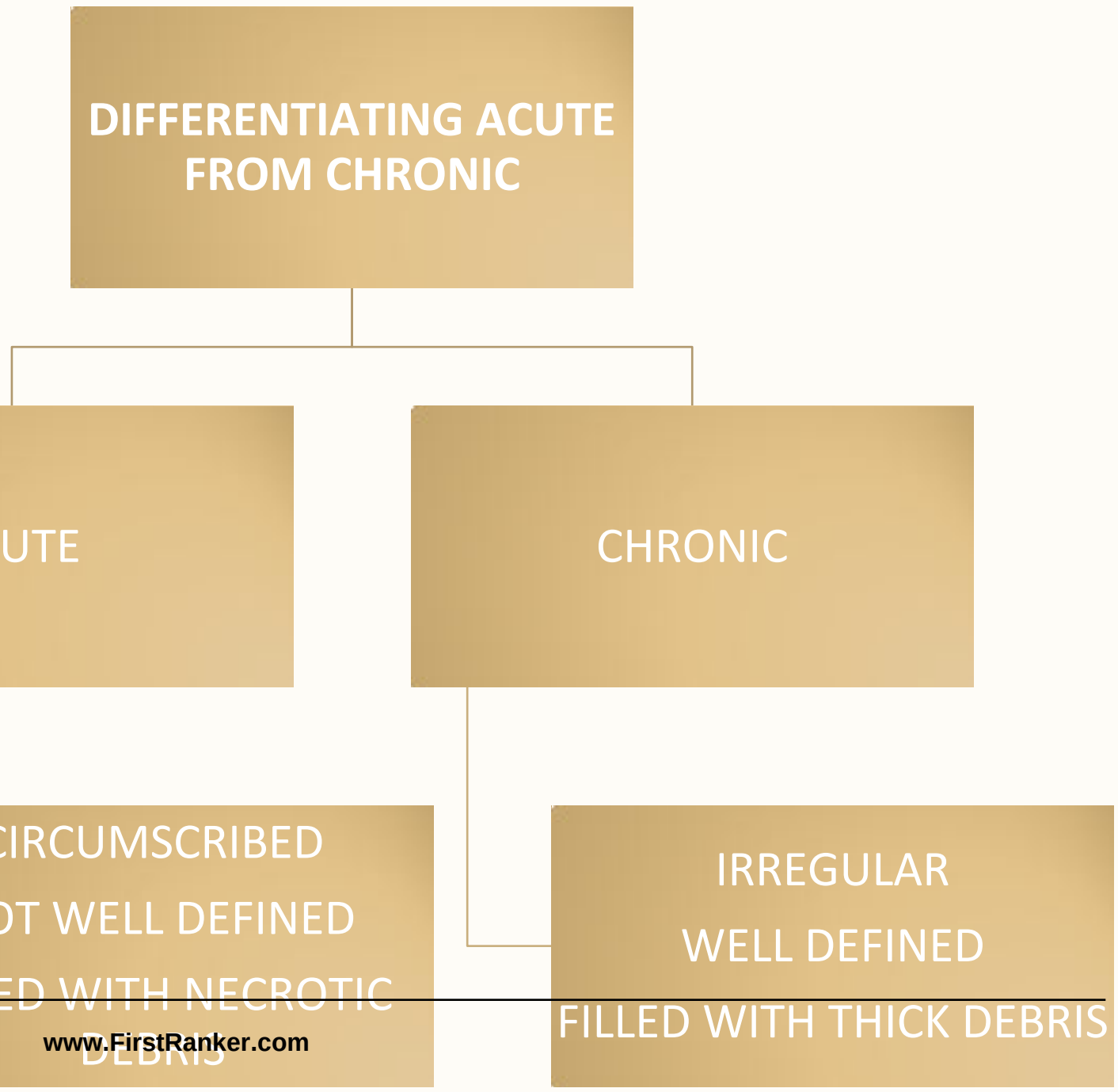
CLASSIFICATION (CONTD.)

- ❖ **ACCORDING TO THE DURATION**:
  - Acute (less than 6 weeks);
  - Chronic (more than 6 weeks)

- ❖ **BY ETIOLOGY**:
  - Primary (aspiration of oropharyngeal secretions, necrotizing pneumonia, immunodeficiency);
  - Secondary (bronchial obstructions, haematogenic dissemination, direct spreading from mediastinal infection, from sub phrenic space, coexisting lung diseases)

- ❖ **WAY OF SPREADING**:
  - Bronchogenic (aspiration of oropharyngeal secretions, bronchial obstruction by tumour, foreign body, enlarged lymph nodes, congenital malformation);
  - Haematogenic (abdominal sepsis, infective endocarditis, septic thromboembolisms)



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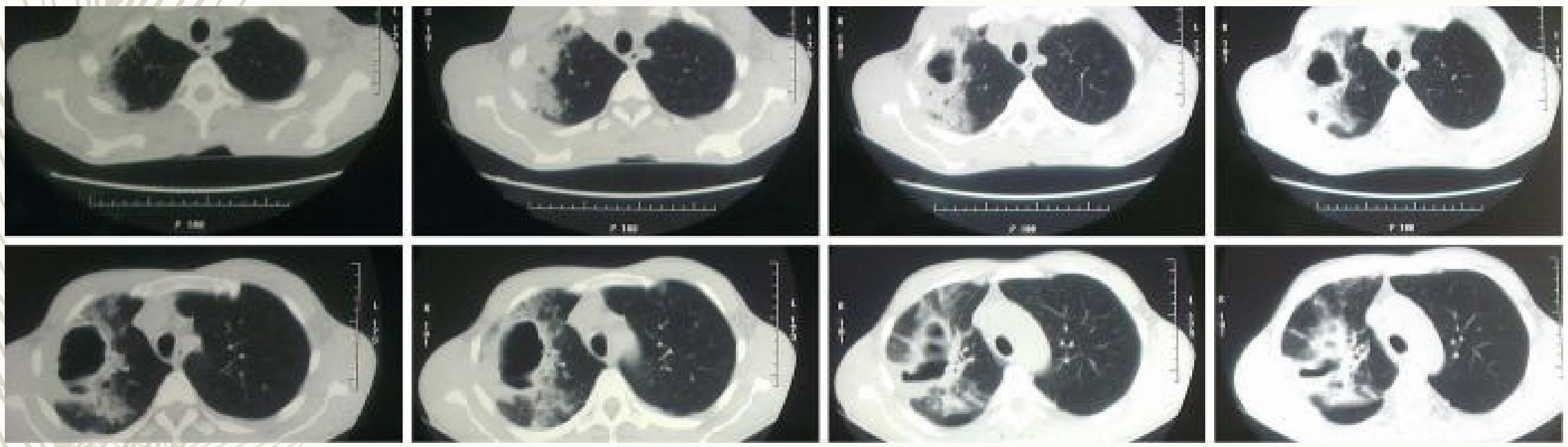

DIFFERENTIAL DIAGNOSIS

- Excavating bronchial carcinoma (squamo-cellular or microcellular)
- Excavating tuberculosis
- Localized pleural empyema
- Infected emphysematous bullae
- Cavitary pneumoconiosis
- Hiatus hernia
- Pulmonary hematoma
- Hydatid cyst of lung
- Cavitary infarcts of lung
- Wegener's granulomatosis

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DIAGNOSIS

- Diagnostic bronchoscopy is a part of diagnostic protocol for taking the material for microbiological examination and to confirm intrabronchial cause of abscess-tumor or foreign body.
- Sputum examination is useful for identification of microbiological agents or confirmation of bronchial carcinoma

MANAGEMENT

STANDARD CONSERVATIVE THERAPY: MEDICAL MANAGEMENT

- It is recommended to treat lung abscess with broad spectrum antibiotics, due to poly microbial flora, such as Clindamycin (600 mg IV on 8 h) and then 300 mg PO on 8 h or combination ampicilin/sulbactam (1.5-3 gr IV on 6 h).
- Alternative therapy is piperacilin/tazobactam 3.375 gr IV on 6 h or Meropenem 1 gr IV on 8 h.
- For MRSA it is recommended to use linezolid 600 mg IV on 12 h or vancomycin 15 mg/kg BM on 12 h.

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MANAGEMENT

SURGICAL

- Endoscopic drainage of lung abscesses is described as an alternative to chest tube drainage and is performed during the bronchoscopy with usage of laser.
- Per cutaneous trans thoracic tube drainage
- Surgical resection of lung abscess is the therapy of choice for about 10% of patients.
- Lobectomy is the resection of choice for large or central position of abscess. Atypical resection or segmentectomy are satisfactory procedures, if it is possible to remove complete abscess and if necessary surrounding lung tissue with necrotizing pneumonia

THANK YOU

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BRONCHIECTASIS

DEFINITION

- Bronchiectasis (broncos, airways; ectasia, dilatation) is a morphologic term used to describe abnormal, irreversibly dilated and thick walled bronchi.
- This is an anatomic definition that evolved from Laennec's original description in 1819 of ectatic bronchi in pathologic specimens.

Laënnec RTH. On mediate auscultation, or a treatise on the diagnosis of diseases of the lungs and heart. Paris: J.-A. Brosson et J.-S. Chaudé; 1819.

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PREVALENCE

US[1]

- Prevalence increased every year from 2000 to 2007 by an annual percentage change of 8.74%.
- Increased with age (peak= 80-84 years)
- Higher in women

UK[2]

- Prevalence in women 566/lakh ; men= 486/lakh
- Women and age more than 60 years associated with higher rate of hospitalization

INDIA

- There is no good data on bronchiectasis in India
- EMBARC INDIA REGISTRY (European Multi Centre Bronchiectasis Audit and Research Collaboration)

1. McShane P, Naureckas E, Tino G, Strek M. Non–Cystic Fibrosis Bronchiectasis. American Journal of Respiratory and Critical Care Medicine. 2013;188(6):647-656.
2. Hill A, Welham S, Sullivan A, Loebinger M. Updated BTS Adult Bronchiectasis Guideline 2018: a multidisciplinary approach to comprehensive care. Thorax. 2018;74(1):1-3.

BURDEN

LONGER HOSPITAL STAY

FREQUENT OPD VISITS

INCREASED EXPENDITURE ON MEDICINES

MORTALITY RATE= 10-16%

RISK FACTORS FOR MORTALITY

LOW FEV1

MALE

INCREASED DYSPNOEA GRADE
ADVANCED AGE

COPD

P. aeruginosa SPUTUM POSITIVITY

- Goeminne PC, Scheers H, Decraene A, Seys S, Dupont LJ. Risk factors for morbidity and death in non–cystic fibrosis bronchiectasis: a retrospective cross-sectional analysis of CT diagnosed bronchiectatic patients. Respir Res 2012;13:21.
- Weycker D, Edelsberg J, Oster G, Tino G. Prevalence and economic burden of bronchiectasis. Clin Pulm Med 2005;12:205–209.

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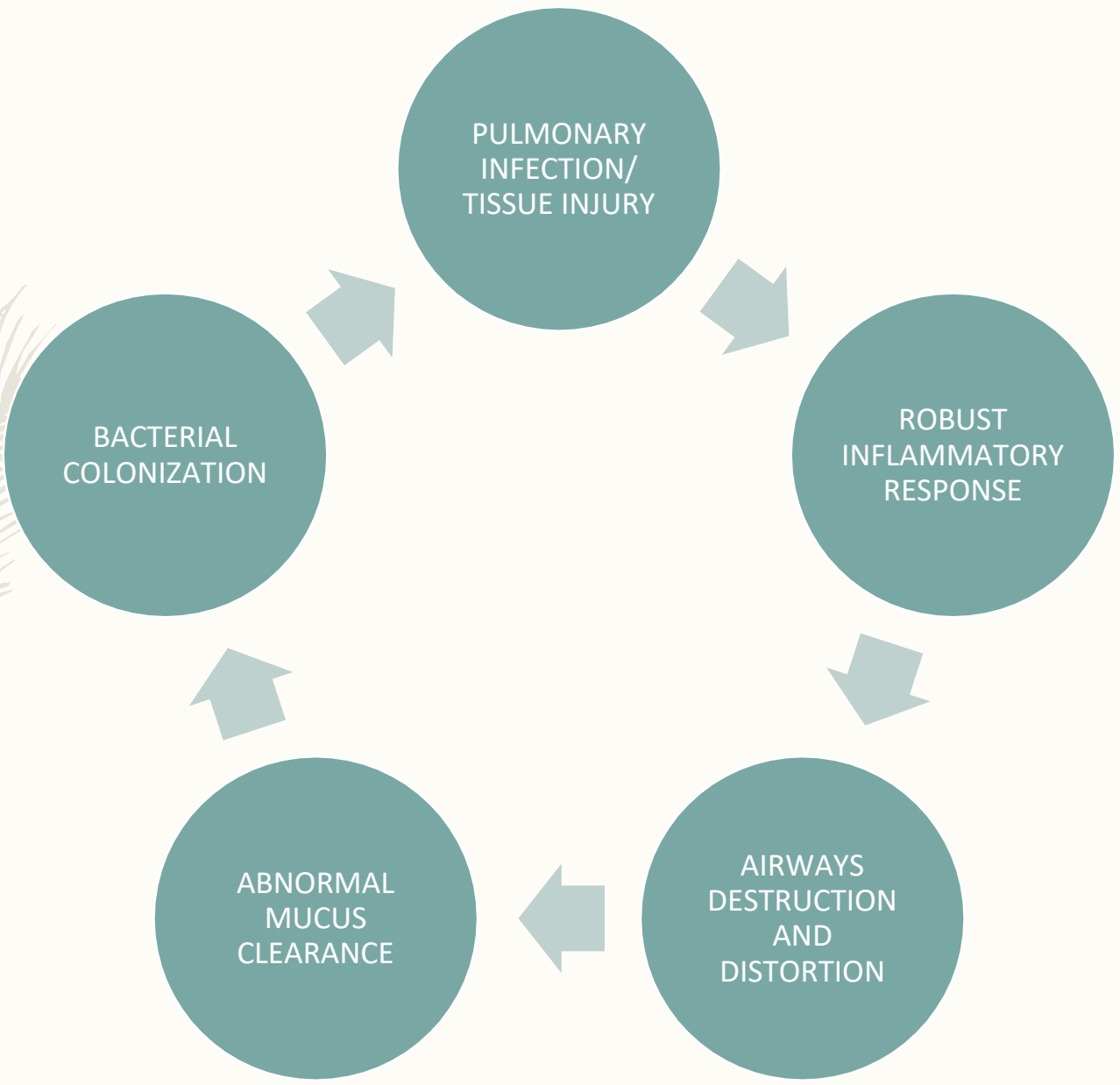
PATHOGENESIS
COLES'S VISCIOUS CYCLE MODEL



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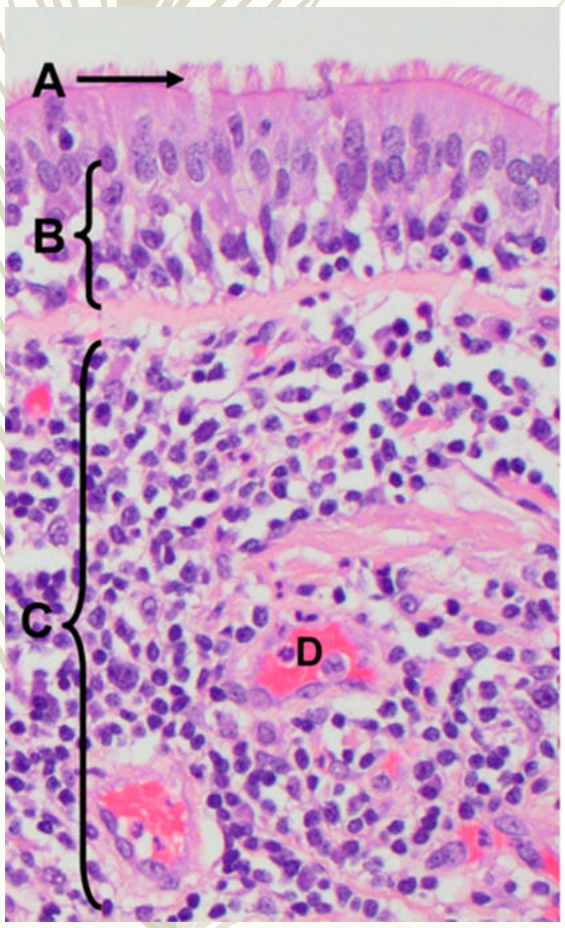
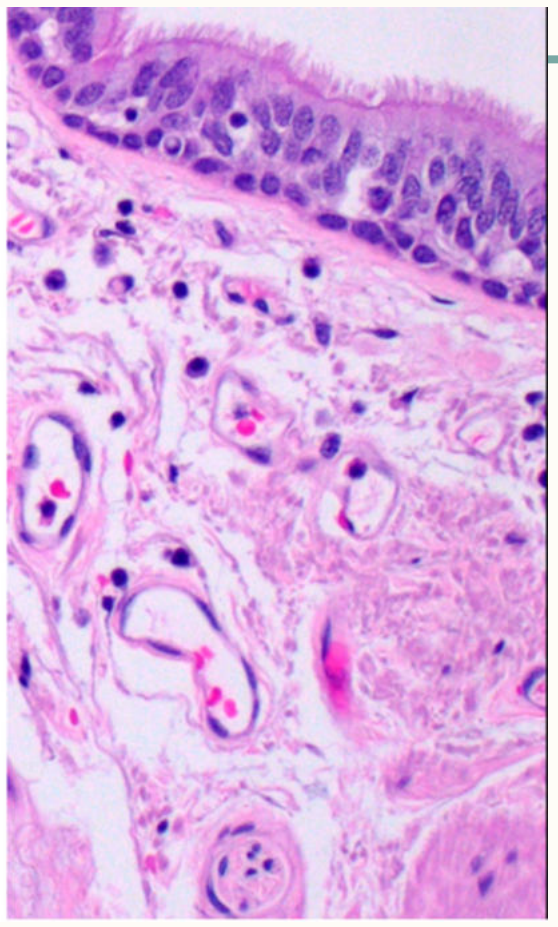
PATHOLOGY



BRONCHIECTATIC



NORMAL

Hematoxylin and eosin stain of the bronchial wall
in a patient with bronchiectasis (left) versus a normal subject (right).
A: Pseudostratified columnar, ciliated epithelium
B: thickened epithelium with intraepithelial lymphocytes
C: submucosa with dense infiltrate of lymphocytes and plasma cells
D: blood vessel with reactive endothelial cells.

TYPES

REIDS CLASSIFICATION

- CYLINDRICAL
- VARICOSE
- SACULAR/CYSTIC

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Reid LM. Reduction in bronchial subdivision in bronchiectasis. Thorax 1950;5:233–247.

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TYPES OF BRONCHIECTASIS

Cylindrical bronchiectasis	Varicose bronchiectasis	Cystic bronchiectasis
Mild	Moderate	Sever
Tram track appearance	String of beads	Cluster of grapes

ETIOLOGY

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Category	Cause/notes	Clinical phenotype	Specific treatment
Post-infection	Viral, bacterial, fungal, mycobacteria (usually classified separately)	Past history of severe infection; classically unilobar bronchiectasis	No specific treatment
NTM	*M. avium* and *M. abscessus* most frequent	Middle-aged or elderly; females with low BMI; middle lobe and lingual nodular bronchiectasis; cavitation; tree-in-bud	Antibiotic treatment
Post-TB	*M. tuberculosis*	Upper lobe most frequently	No specific therapy
ABPA	Hypersensitivity to *A. fumigatus*	History of asthma (not universal); thick sputum; *S. aureus* in sputum; central bronchiectasis; fleeting infiltrates	Steroids±antifungals
COPD	Smoking, biomass exposure	Fixed airflow obstruction; smoking history; bilateral lower lobe; tubular bronchiectasis	No specific therapy
Asthma	Not universally accepted as a cause of bronchiectasis	Long history of asthma; frequent exacerbations; neutrophilic airway inflammation	Inhaled corticosteroids, biologics *e.g.* anti-IgE and anti-IL5
Aspiration/inhalation	Foreign body aspiration, gastric contents aspiration, inhalation of corrosive substances	Lower lobe bronchiectasis	Speech and language therapy, fundoplication, removal of exacerbating drugs
Obstruction	Benign tumours, enlarged lymph nodes	Single lobe bronchiectasis	Removal of obstruction *via* bronchoscopy or thoracic surgery
Congenital defects of large airways	Marfan syndrome, Mounier-Kuhn syndrome (tracheobronchomegaly), Williams–Campbell syndrome (bronchial cartilage deficiency)	Specific features depending on the congenital defect	Dependant on the underlying disorder
AATD	Unopposed protease activity	Combined emphysema and bronchiectasis	Augmentation therapy is available in some countries
Yellow nail syndrome	Lymphatic obstruction	Dystrophic nails, pleural effusions, rhinosinusitis	Local treatment for nails *e.g.* vitamin-E, management of lymphoedema
Immunological defects	Primary: common variable immune deficiency, agammaglobulinemia, hyper-IgE syndrome; secondary: chemotherapy, immunosuppressant therapy, malignancy, HIV/AIDS	Varied clinical pattern depending on the underlying cause; patient may give a history of non-respiratory infections	Ig replacement, prophylactic antibiotics, treatment of underlying disorder, removal of iatrogenic immunosuppression
Young's syndrome	Cause not known	Bronchiectasis, rhinosinusitis and [illegible] infertility	See ciliary disorders below

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PCD	Genetic	Middle lobe and lower lobe bronchiectasis; rhinosinusitis; middle ear infections; situs inversus in some cases	Recognition and treatment of associated problems (including rhinosinusitis, middle ear disease, infertility, ectopic pregnancy), genetic counselling, intensive airway clearance
Systemic inflammatory disease	Rheumatoid arthritis, sarcoidosis, systemic lupus erythematosus, Sjögren syndrome	Varied clinical pattern, often rapidly progressive	No specific treatment
Inflammatory bowel disease	Ulcerative colitis, Crohn's syndrome, coeliac disease	Varied clinical pattern often high sputum volumes and steroid responsive	Inhaled and systematic corticosteroids, treatment of the underlying condition
Adult CF	CFTR mutations	Upper lobe bronchiectasis; *P. aeruginosa* or *S. aureus* in sputum; non-respiratory manifestations	Specialist multidisciplinary care in adult CF centres, recognition and treatment of non-respiratory manifestations, CFTR modulator/corrector therapy
Diffuse panbronchiolitis	Idiopathic inflammatory disease	Mostly patients of Far Eastern ethnic origin	Macrolide antibiotics

IN WHOM TO SUSPECT ?

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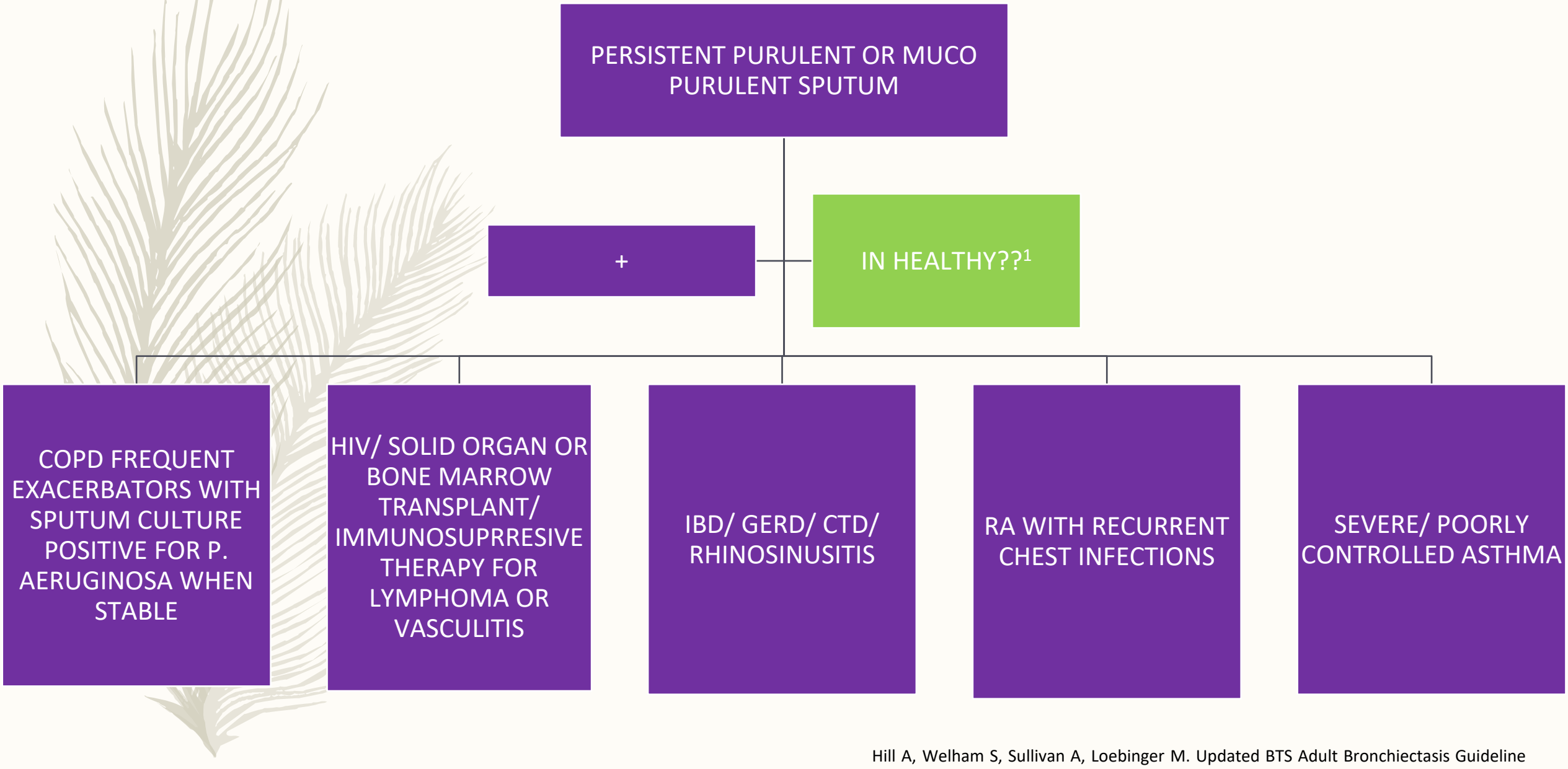

Hill A, Welham S, Sullivan A, Loebinger M. Updated BTS Adult Bronchiectasis Guideline 2018: a multidisciplinary approach to comprehensive care. Thorax. 2018;74(1):1-3.

ALGORITHM FOR EVALUATION OF BRONCHIECTASIS

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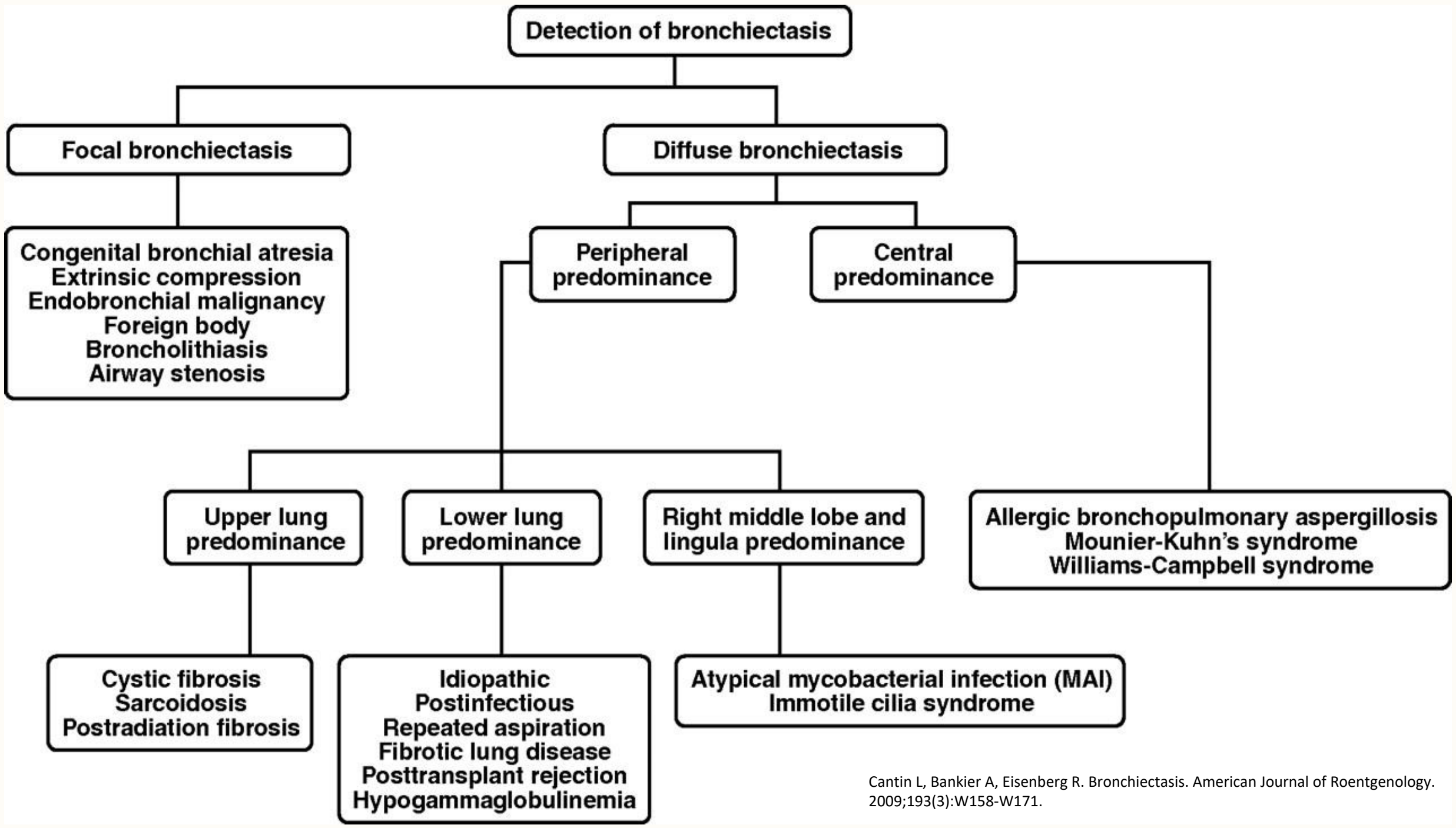

Cantin L, Bankier A, Eisenberg R. Bronchiectasis. American Journal of Roentgenology. 2009;193(3):W158-W171.

INVESTIGATION: RADIOLOGY

- BASELINE CHEST RADIOGRAPH
- THIN SECTION CT [HRCT THORAX]

CT FEATURES OF BRONCHIECTASIS

❖***BRONCHIAL DILATATION SUGGESTED BY***

- BRONCHOARTERIAL RATIO >1 (INTERNAL AIRWAY LUMEN VS ADJACENT PULMONARY ARTERY)
- LACK OF TAPERING
- AIRWAY VISIBILITY WITHIN 1CM OF COSTAL PLEURAL SURFACE OR TOUCHING MEDIASTINAL PLEURA.

❖***INDIRECT SIGNS***

- BRONCHIAL WALL THICKENING
- MUCUS IMPACTION
- MOSAIC PERFUSION / AIR TRAPPING ON EXPIRATORY CT

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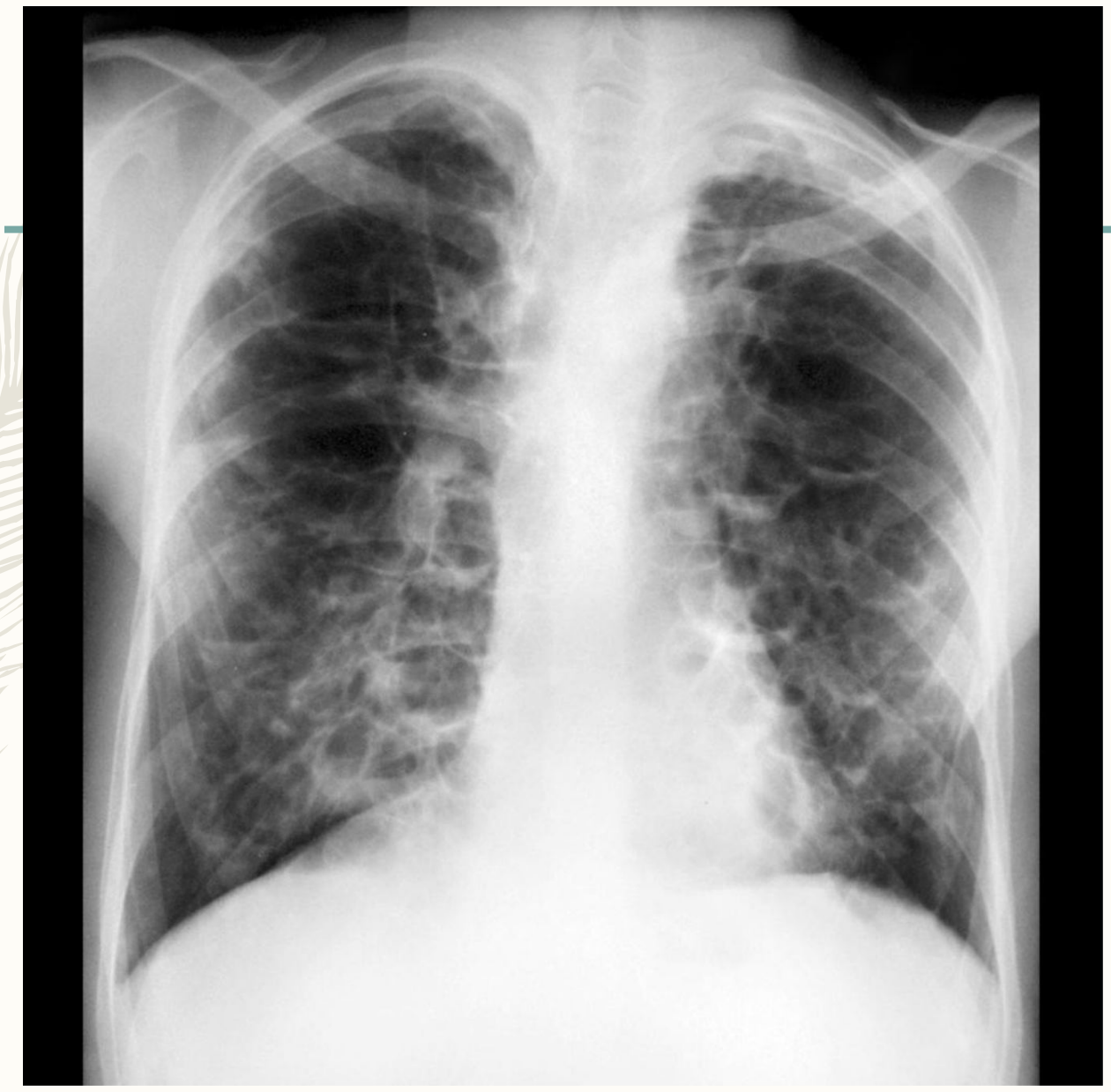
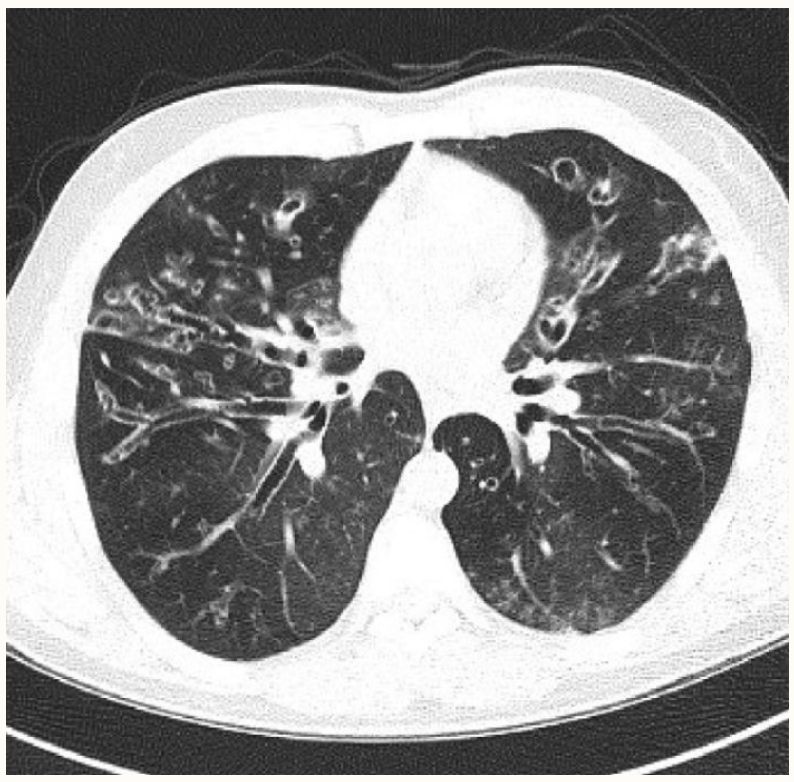
CHEST RADIOGRAPH



CYLINDRICAL BRONCHIECTASIS

WITHIN I CM OF PLEURA

TRAM TRACK SIGN



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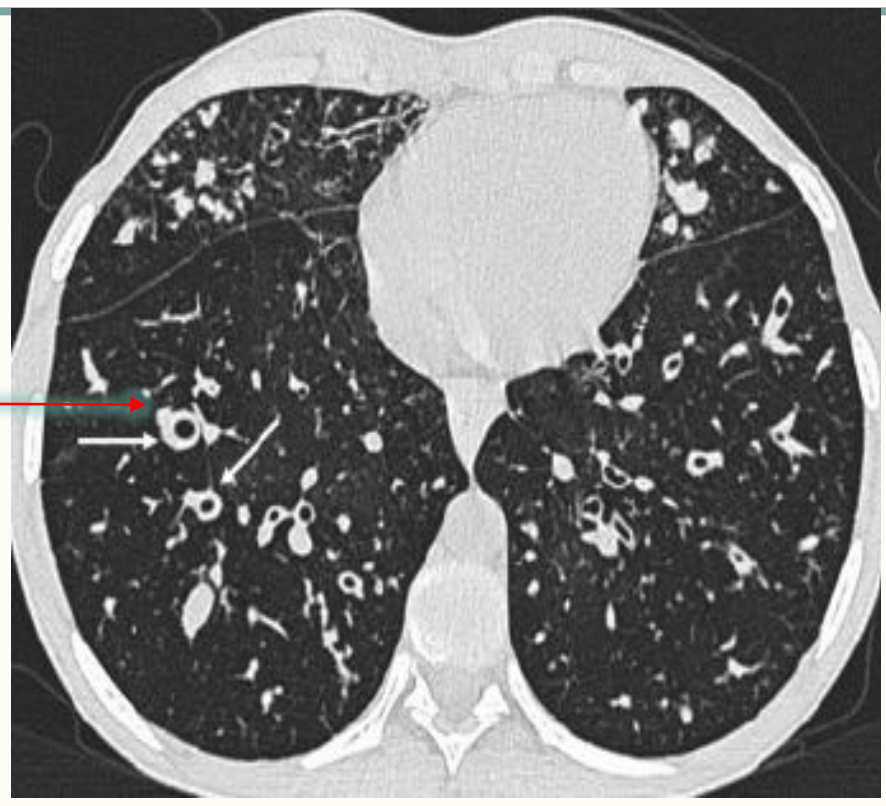
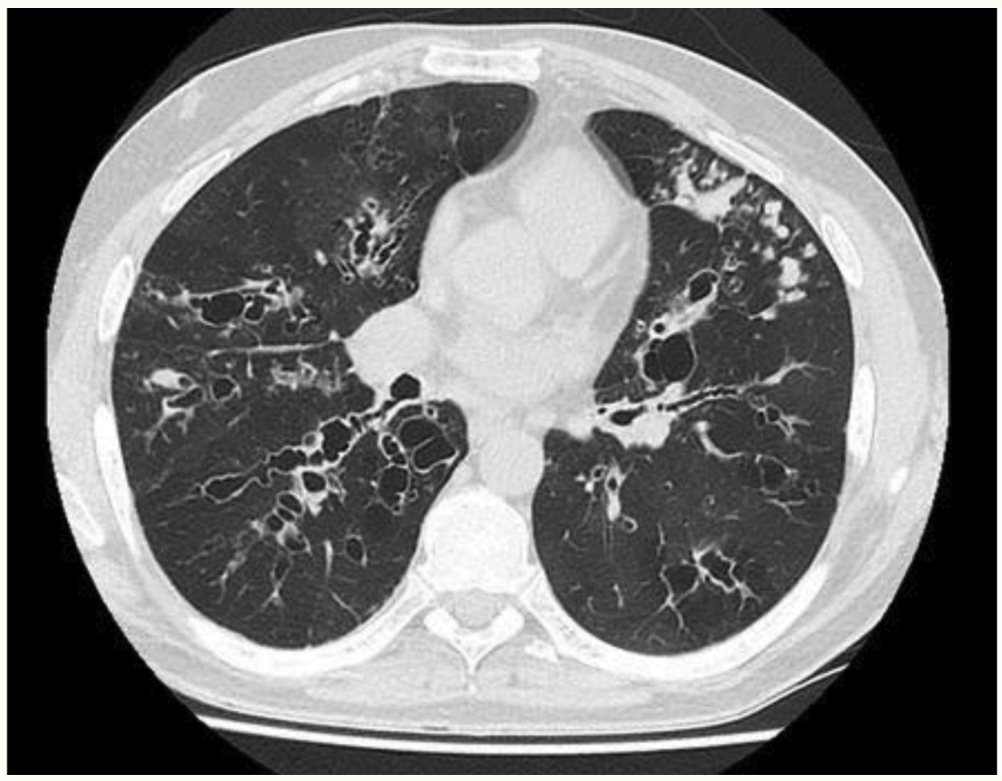


SIGNET RING SIGN

VARICOSE BRONCHIECTASIS



VARICOSE

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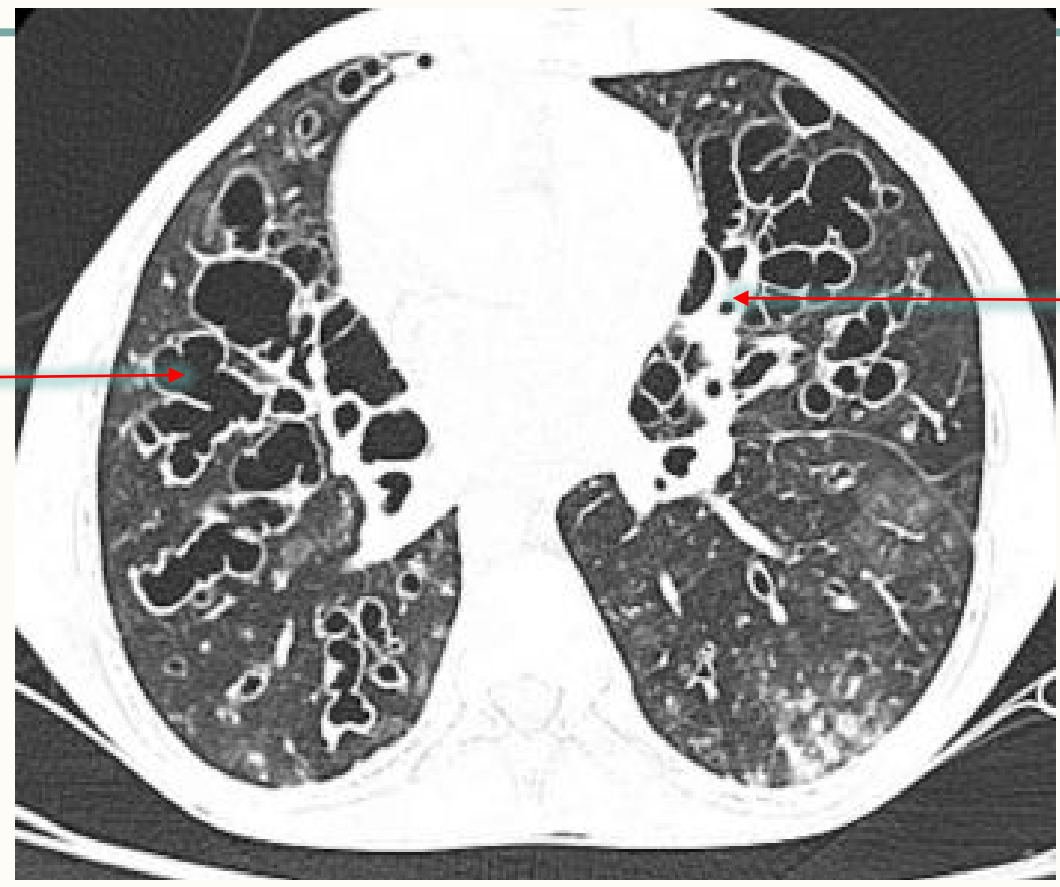
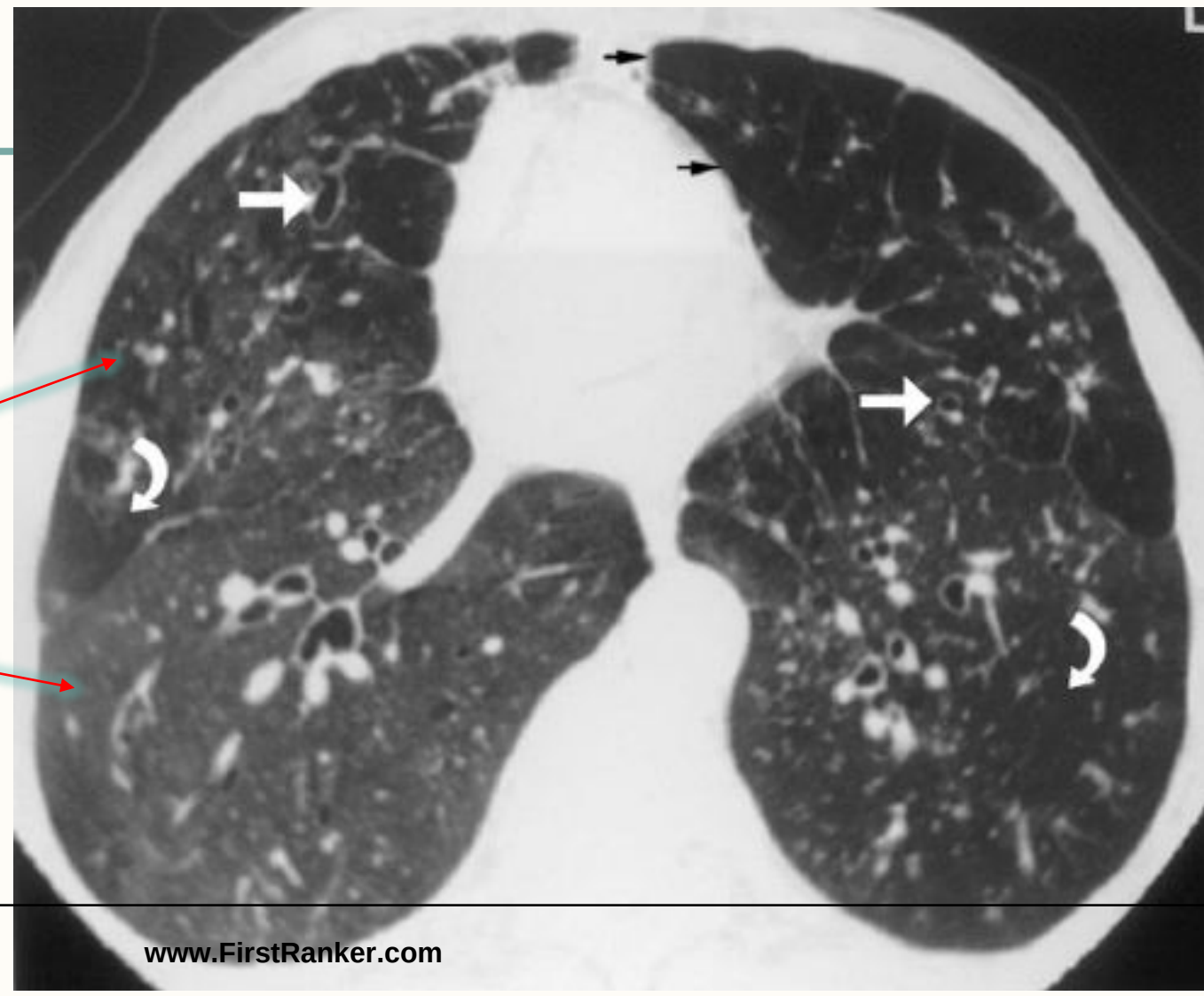
CYSTIC BRONCHIECTASIS



MOSAIC PERFUSION



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INVESTIGATIONS FOR CAUSE

IN ALL

- COMORBIDITIES AND RELEVANT PAST HISTORY
- FULL BLOOD COUNT/ SERUM TOTAL IGE/ SKIN PRICK TEST TO A. FUMIGATUS
- SERUM Ig G/ IgA/ IgM
- BASELINE SPECIFIC ANTIBODY LEVELS AGAINST CAPSULAR POLYSACCHRIDES OF STREPTOCOCCUS PNEUMONIAE

CLINICALLY STABLE

- SPUTUM CULTURE : ROUTINE AND MYCOBACTERIAL

CLINICALLY SUSPECT

- HIV
- TEST FOR CYSTIC FIBROSIS/ PCD/ GERD
- RA, ANTI CCP , ANCA, ANA
- ALPHA 1 AT
- BRONCHIAL ASPIRATION OR WASH

Hill A, Welham S, Sullivan A, Loebinger M. Updated BTS Adult Bronchiectasis Guideline 2018: a multidisciplinary approach to comprehensive care. Thorax. 2018;74(1):1-3.

STEPWISE MANAGEMENT

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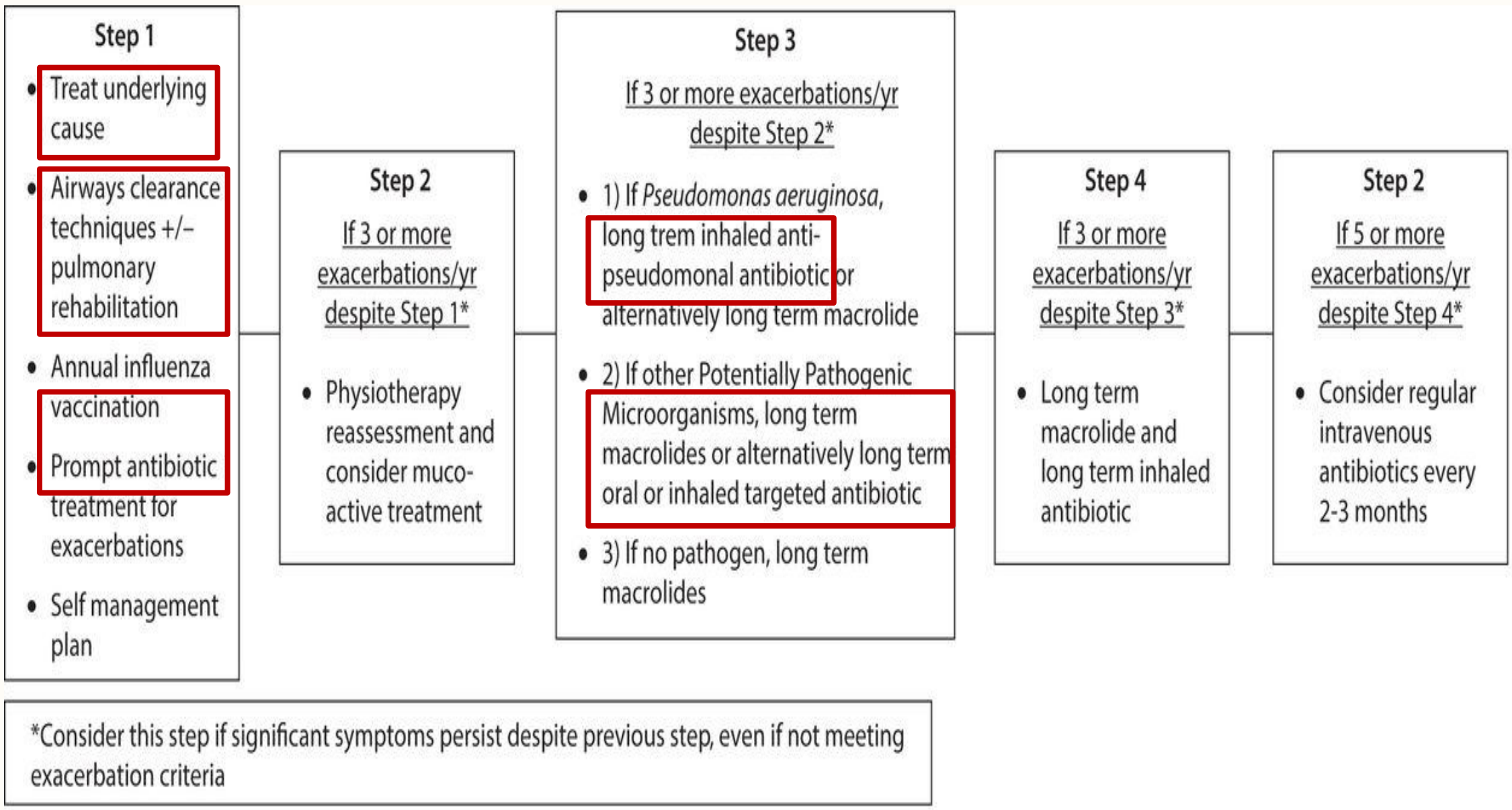

Antibiotics are used to treat exacerbations that present with an acute deterioration (usually over several days) with worsening local symtoms (cough, increased sputum volume or change of viscosity, increased sputum purulence with or without increasing wheeze, breathlessness, haemoptysis) and/or systemic upset. The flow diagram refers to three or more annual exacerbations.

THORAX

AIRWAY CLEARANCE

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Physiotherapy management-stepwise airway clearance.

STEP 1

Offer active cycle of breathing techniques (ACBT) to individuals with bronchiectasis.

Consider gravity assisted positioning (where not contraindicated) to enhance the effectiveness of an airway clearance technique. If contraindicated then modified postural drainage should be used.

Patients should be reviewed within 3 months.

This should include evaluation of patient reported effectiveness (ease of clearance/patient adherence).

The inclusion of gravity assisted positioning should be evaluated for its additional effectiveness.

STEP 2

If ACBT is not effective or the patients demonstrates poor adherence, oscillating Positive Expiratory Pressures + Forced Expiration Technique should be considered.

STEP 3

If airway clearance is not effective then nebulised Isotonic (0.9% saline) or Hypertonic Saline (3% saline and above) should be evaluated for its effectiveness pre-airway clearance (especially in patients with viscous secretions or there is evidence of sputum plugging)

Individuals should be advised to complete Airway Clearance in the following order, if prescribed:

– Bronchodilator

– Mucoactive treatment

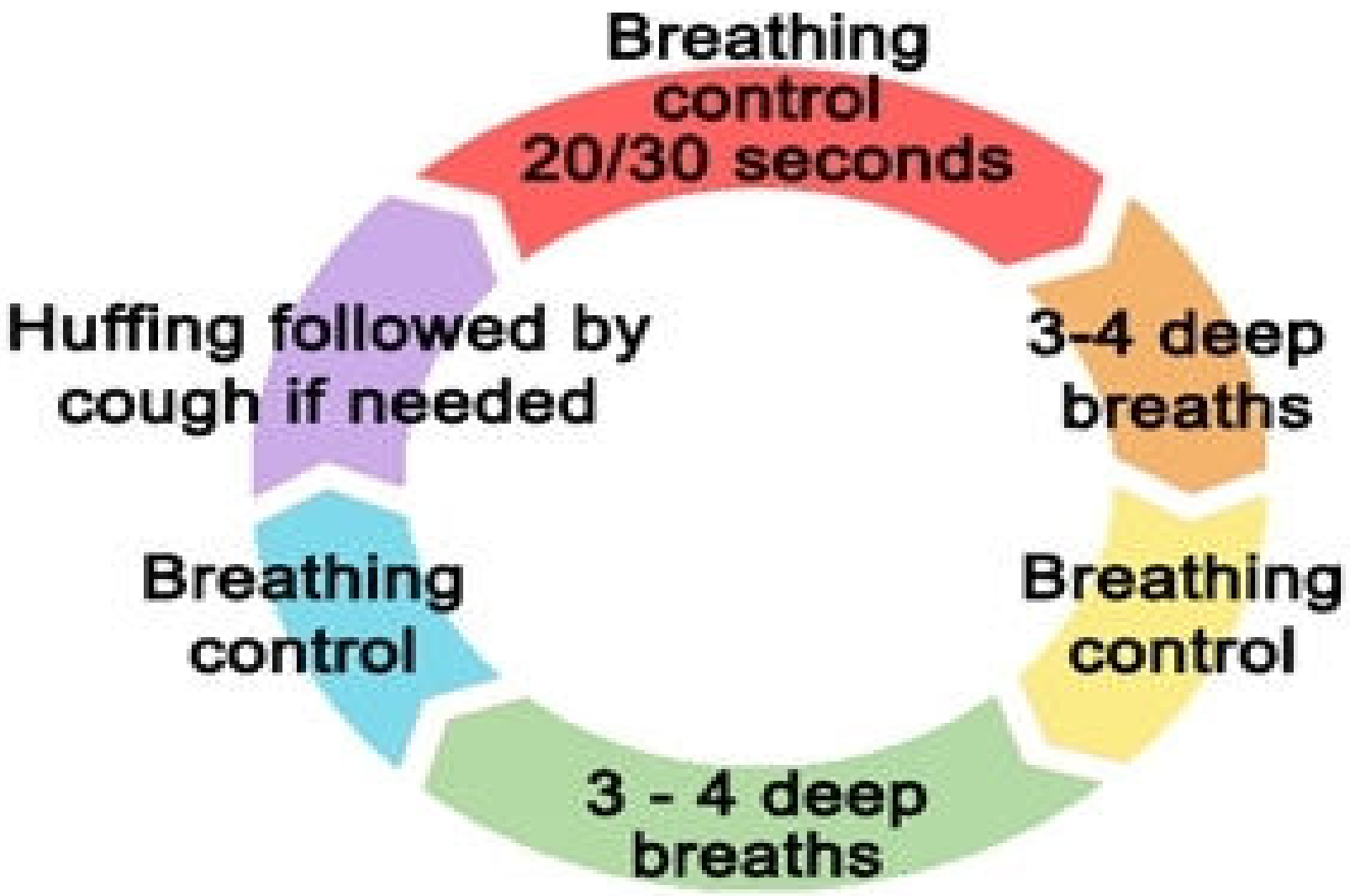
– Airway Clearance

– Nebulised antibiotic and/or inhaled steroids (if applicable)

ACBT: Active cycle of breathing techniques

THORAX

ACBT



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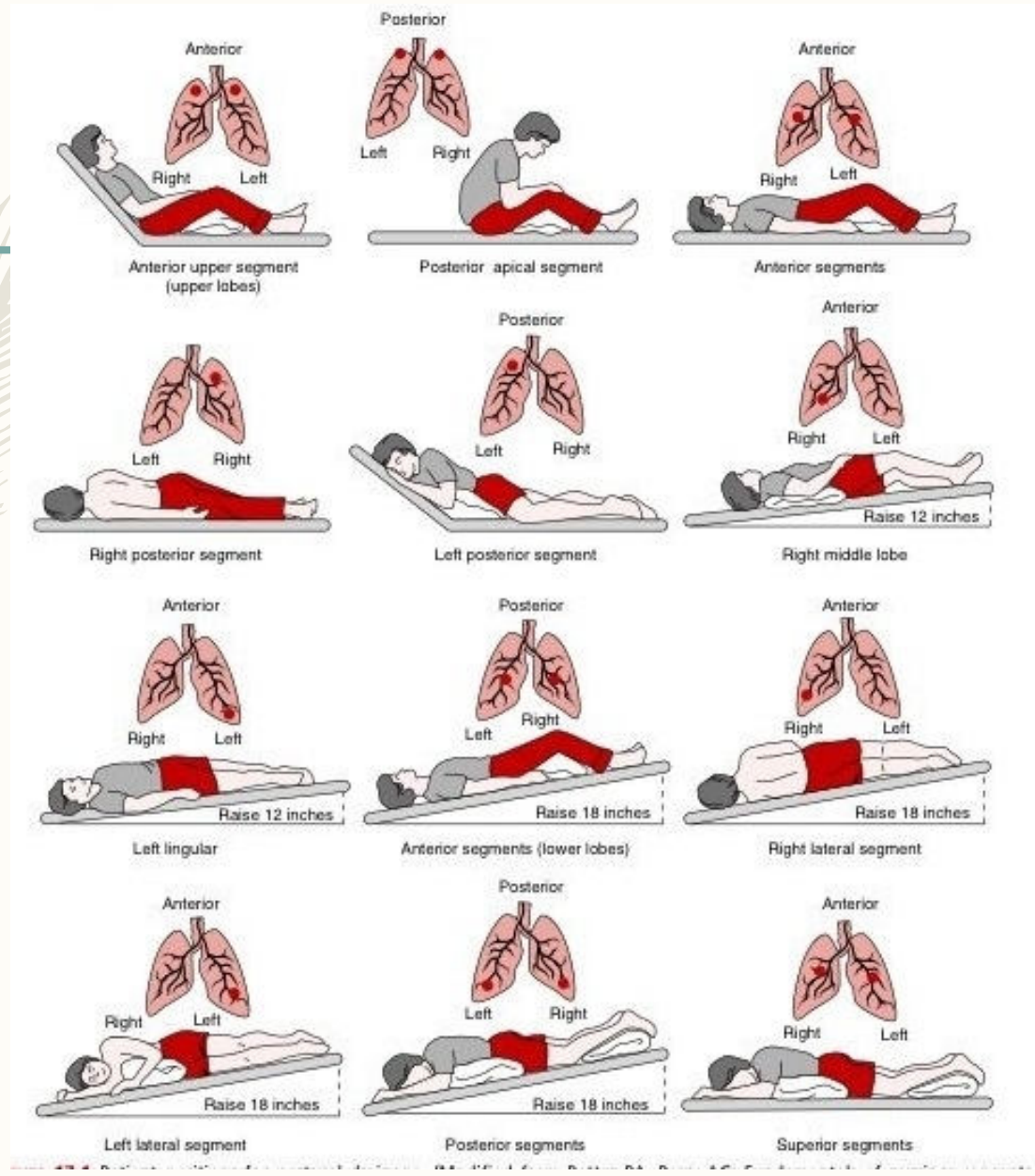
POSTURAL DRAINAGE



Airway clearance - exacerbations.

STEP 1	STEP 2	STEP 3
Increase airway clearance frequency. E.g.: from twice daily to three/four times daily.	Commence the use of mPD or PD if tolerated. For individuals with radiological changes, PD or mPD should be targeted appropriately.	Individuals with ongoing difficulty with airway clearance may benefit from the addition of other techniques. It is recommended that these should be commenced and evaluated in the following order (unless contraindicated) 1. Enhanced humidification / hydration of airways if secretions viscous (isotonic (0.9% saline) or hypertonic saline (3% saline and above)/humidification/increased fluid intake) 2. Manual Techniques 3. Positive pressure devices including Intermittent Positive Pressure Breathing (IPPB) or Non Invasive Ventilation (NIV) to be used during Airway Clearance

PD=postural drainage; mPD= modified postural drainage

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ANTIBIOTIC TREAMENT FOR EXACERBATION

Common organisms associated with acute exacerbation of bronchiectasis and suggested antimicrobial agents- adults

Organism	Recommended first line treatment	Length of treatment	Recommended second line treatment	Length of treatment
Streptococcus pneumoniae	Amoxicillin 500 mg Three times a day	14 days	Doxycycline 100 mg BD	14 days
Haemophilus influenzae- beta lactamase negative	Amoxicillin 500 mg Three times a day Or Amoxicillin 1G Three times a day Or Amoxicillin 3G BD	14 days	Doxycycline 100 mg BD Or Ciprofloxacin 500 mg or 750 mg BD Or Ceftriaxone 2G OD (IV)	14 days
Haemophilus influenzae- beta lactamase positive	Amoxicillin with clavulanic acid 625 one tablet Three times a day	14 days	Doxycycline 100 mg bd Or Ciprofloxacin 500 mg or 750 mg BD Or Ceftriaxone 2G OD (IV)	14 days
Moraxella catarrhalis	Amoxicillin with clavulanic acid 625 one tablet Three times a day	14 days	Clarithromycin 500 mg BD Or Doxycycline 100 mg BD Or Ciprofloxacin 500 mg or 750 mg BD	14 days
Staphylococcus aureus (MSSA)	Flucloxacillin 500 mg Four times a day	14 days	Clarithromycin 500 mg BD Or Doxycycline 100 mg BD Or Amoxicillin with clavulanic acid 625 one tablet Three times a day	14 days

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Staphylococcus aureus (MRSA) Oral preparations	Doxycycline 100 mg BD Rifampicin (<50 Kg) 450 mg OD Rifampicin (>50 Kg) 600 mg OD Trimethoprim 200 mg BD	14 days	Third line Linezolid 600 mg BD	14 days
Staphylococcus aureus (MRSA) Intravenous preparations	Vancomycin 1 gm BD* (monitor serum levels and adjust dose accordingly) or Teicoplanin 400 mg OD	14 days	Linezolid 600 mg BD	14 days
Coliforms for example, Klebsiella, enterobacter	Oral Ciprofloxacin 500 mg or 750 mg BD	14 days	Intravenous Ceftriaxone 2G OD	14 days
Pseudomonas aeruginosa	Oral Ciprofloxacin 500 mg bd (750 mg bd in more severe infections)	14 days	**Monotherapy:** Intravenous Ceftazidime 2G TDS or Piperacillin with tazobactam 4.5G TDS or Aztreonam 2G TDS or Meropenem 2G TDS **Combination therapy** The above can be combined with gentamicin or tobramycin or Colistin 2MU TDS (under 60 kg, 50 000–75 000 Units/kg daily in 3 divided doses) Patients can have an *in vivo* response despite in vitro resistance. Caution with aminoglycosides as highlighted below but also if previous adverse events, particularly previous ototoxicity/acute kidney injury due to aminoglycosides	14 days

WHAT IS THE ROLE OF SURGERY IN MANAGING BRONCHIECTASIS?

RECOMMENDATIONS

- Consider lung resection in patients with localized disease whose symptoms are not controlled by medical treatment optimized by a bronchiectasis specialist. (D)
- Offer multidisciplinary assessment, including a bronchiectasis physician, a thoracic surgeon and an experienced anesthetist, of suitability for surgery and pre-operative assessment of cardiopulmonary reserve post resection. (D)

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LUNG TRANSPLANTATION FOR BRONCHIECTASIS

Recommendations

- Consider transplant referral in bronchiectasis patients aged 65 years or less if the FEV_1 is <30% with significant clinical instability or if there is a rapid progressive respiratory deterioration despite optimal medical management. (D)
- Consider earlier transplant referral in bronchiectasis patients with poor lung function and the following additional factors: massive haemoptysis, severe secondary pulmonary hypertension, ICU admissions or respiratory failure (particularly if requiring NIV).(D)

LUNG ABSCESS

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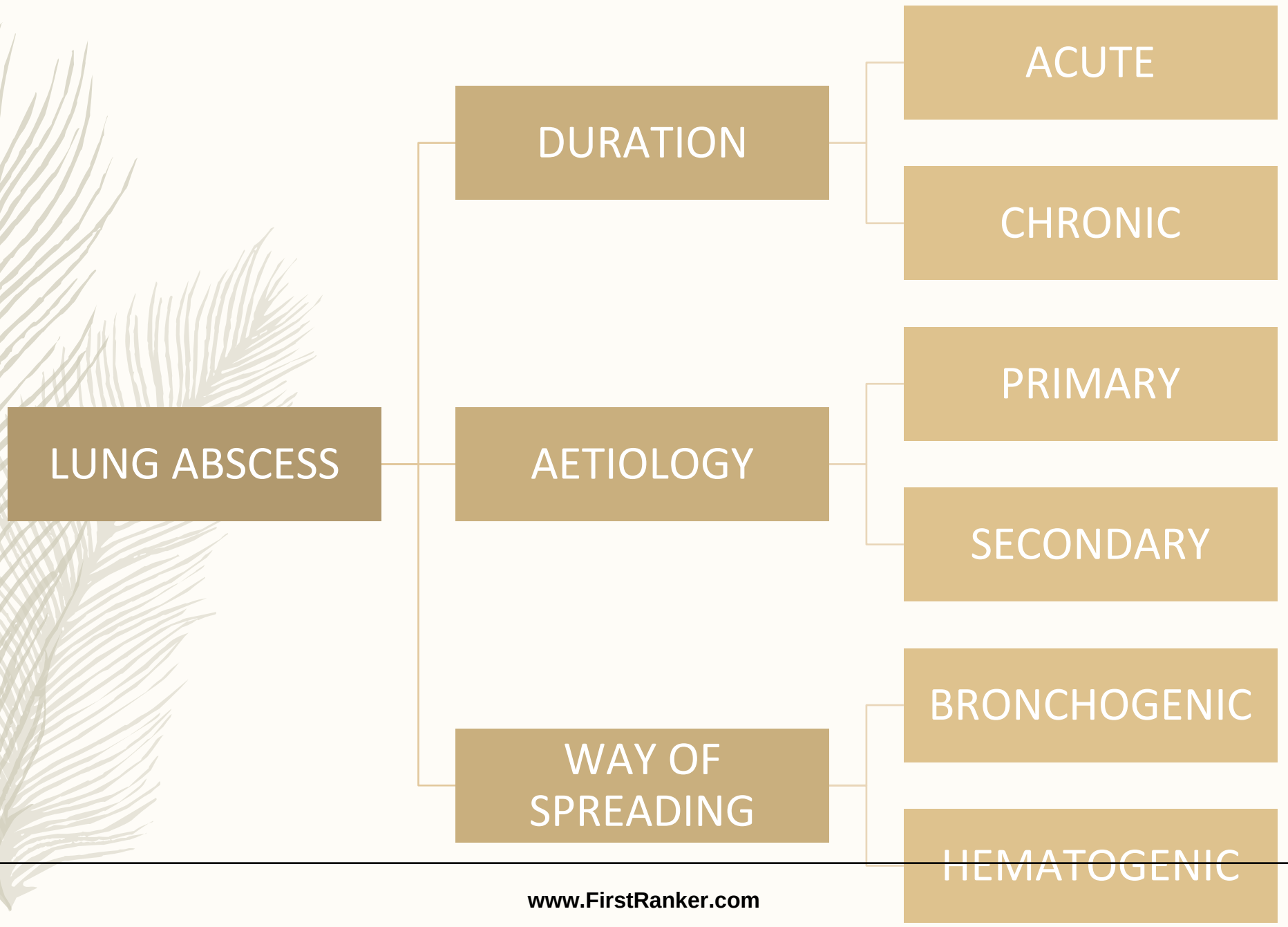
DEFINITION

Localized area of lung suppuration, leading to necrosis of the lung parenchyma with or without cavity formation.

Type of liquefactive necrosis of the lung tissue and formation of cavities (more than 2 cm) containing necrotic debris or fluid caused by microbial infection.



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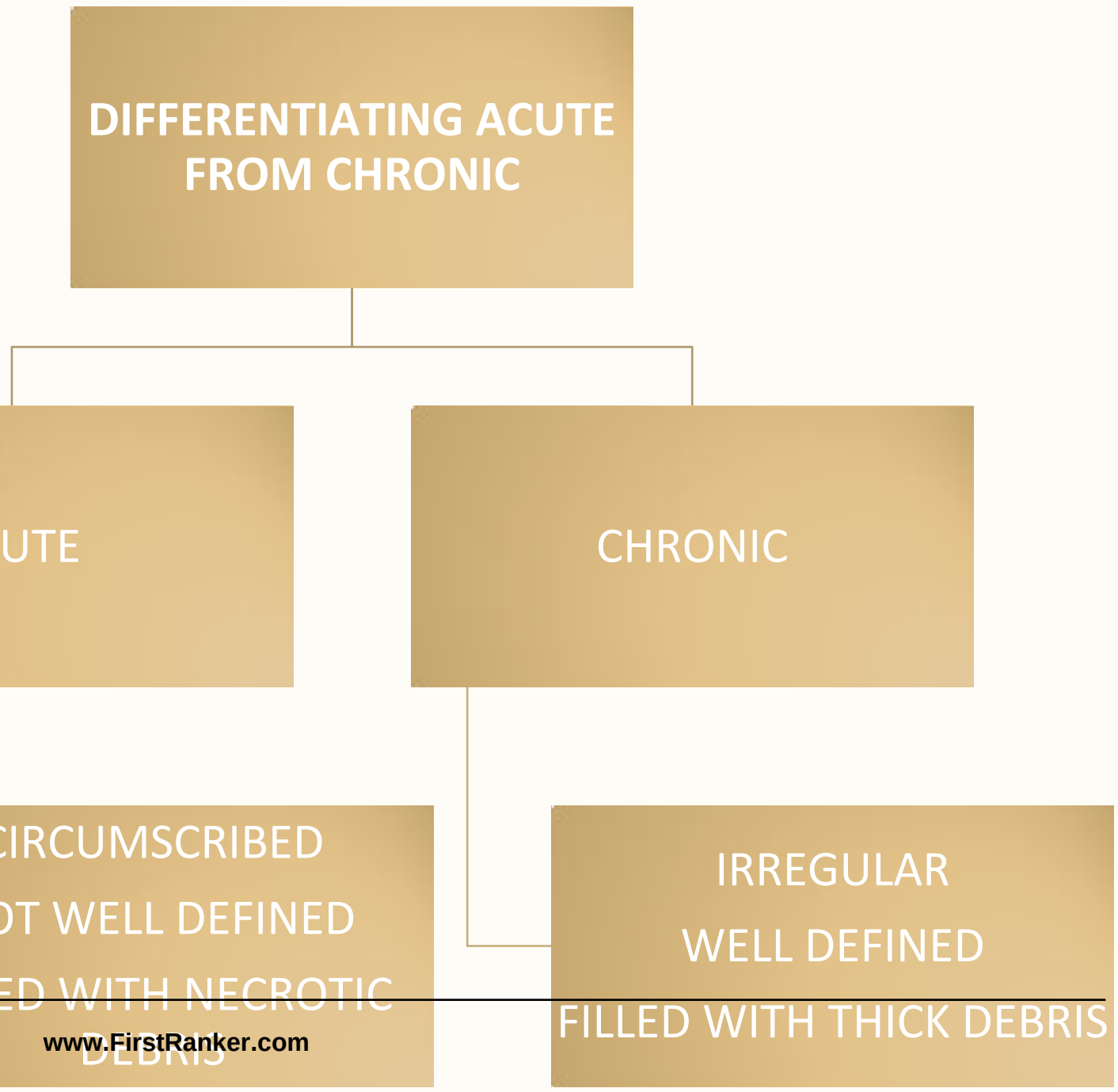
CLASSIFICATION (CONTD.)

- ❖ **ACCORDING TO THE DURATION**:
  - Acute (less than 6 weeks);
  - Chronic (more than 6 weeks)

- ❖ **BY ETIOLOGY**:
  - Primary (aspiration of oropharyngeal secretions, necrotizing pneumonia, immunodeficiency);
  - Secondary (bronchial obstructions, haematogenic dissemination, direct spreading from mediastinal infection, from sub phrenic space, coexisting lung diseases)

- ❖ **WAY OF SPREADING**:
  - Bronchogenic (aspiration of oropharyngeal secretions, bronchial obstruction by tumour, foreign body, enlarged lymph nodes, congenital malformation);
  - Haematogenic (abdominal sepsis, infective endocarditis, septic thromboembolisms)



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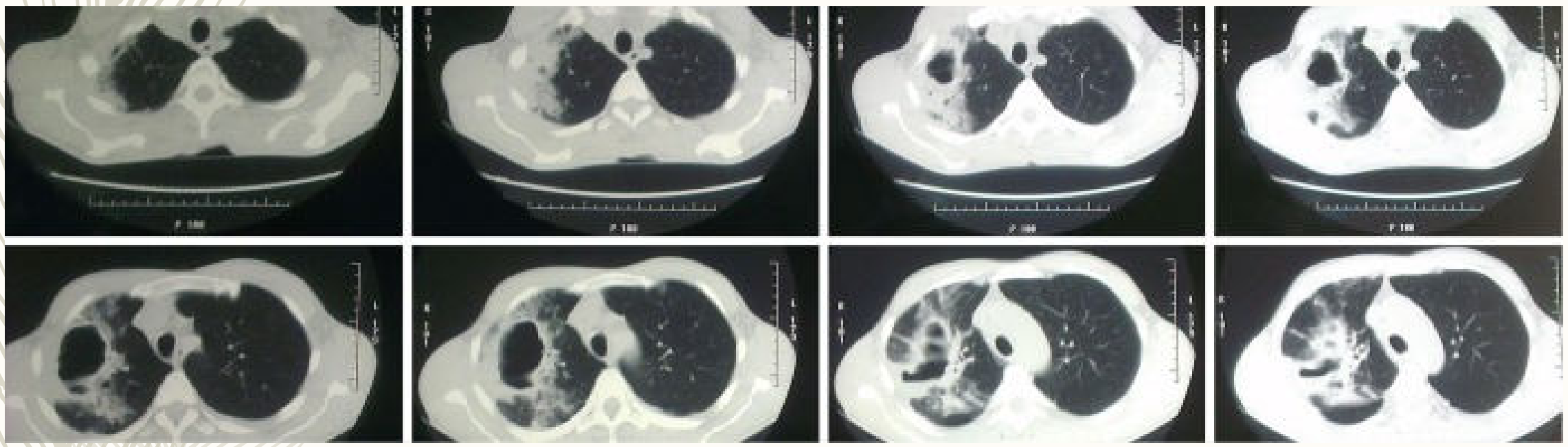

DIFFERENTIAL DIAGNOSIS

- Excavating bronchial carcinoma (squamo-cellular or microcellular)
- Excavating tuberculosis
- Localized pleural empyema
- Infected emphysematous bullae
- Cavitary pneumoconiosis
- Hiatus hernia
- Pulmonary hematoma
- Hydatid cyst of lung
- Cavitary infarcts of lung
- Wegener's granulomatosis

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DIAGNOSIS

- Diagnostic bronchoscopy is a part of diagnostic protocol for taking the material for microbiological examination and to confirm intrabronchial cause of abscess-tumor or foreign body.
- Sputum examination is useful for identification of microbiological agents or confirmation of bronchial carcinoma

MANAGEMENT

STANDARD CONSERVATIVE THERAPY: MEDICAL MANAGEMENT

- It is recommended to treat lung abscess with broad spectrum antibiotics, due to poly microbial flora, such as Clindamycin (600 mg IV on 8 h) and then 300 mg PO on 8 h or combination ampicilin/sulbactam (1.5-3 gr IV on 6 h).
- Alternative therapy is piperacilin/tazobactam 3.375 gr IV on 6 h or Meropenem 1 gr IV on 8 h.
- For MRSA it is recommended to use linezolid 600 mg IV on 12 h or vancomycin 15 mg/kg BM on 12 h.

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MANAGEMENT

SURGICAL

- Endoscopic drainage of lung abscesses is described as an alternative to chest tube drainage and is performed during the bronchoscopy with usage of laser.
- Per cutaneous trans thoracic tube drainage
- Surgical resection of lung abscess is the therapy of choice for about 10% of patients.
- Lobectomy is the resection of choice for large or central position of abscess. Atypical resection or segmentectomy are satisfactory procedures, if it is possible to remove complete abscess and if necessary surrounding lung tissue with necrotizing pneumonia

THANK YOU

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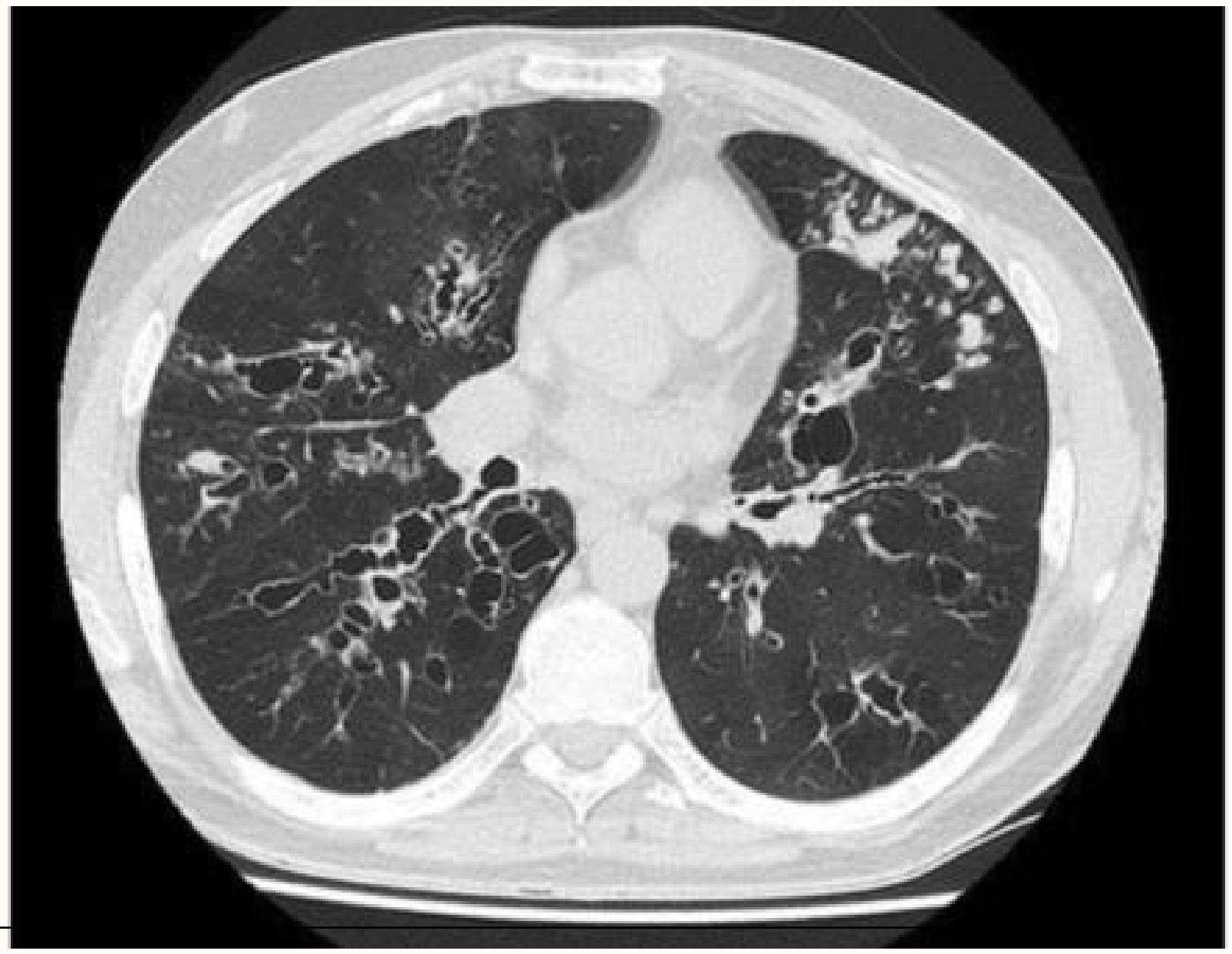
CASE 1

- A 42-year-old man, gardener
- Long history of respiratory problems starting in early childhood.
- Previously diagnosed as asthma.
- Frequent absence from work due to “recurrent chest infections”.
- Unaware of any neonatal issues but believes that he was born at home without complications and is unsure of any previous tests he has had as he is now estranged from his parents.
- Has a cousin with a “lung disease”.
- Married but has “no kids”



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INVESTIGATIONS

- Sputum culture: P. aeruginosa
- Sweat chloride = 73 meq/liter
- Cystic fibrosis genetics: genotype was F508del/R117H

- **CYSTIC FIBROSIS**: Multisystem disorder caused by mutations in the gene that encodes the CF transmembrane conductance regulator (CFTR) protein, a chloride channel expressed in epithelial cells.
- More than 2000 CFTR mutations have been identified to date, but only the functional importance of a small number is known to cause the disease

HRCT THORAX

- An upper lobe predominant distribution of cylindrical, cystic and varicose bronchiectasis associated with airway wall thickening, mucus plugging and parenchymal opacities on a HRCT scan should raise the suspicion of CF disease.
- The presence of nasal polyposis and/or chronic rhinosinusitis, recurrent pancreatitis, malabsorption, diabetes, osteoporosis and male infertility are other typical features of CF

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DIAGNOSIS

Guidelines published by the Cystic Fibrosis Foundation in the USA allows diagnosis if:

1. Clinical presentation of the disease and evidence of biochemical and genetic markers of CFTR dysfunction.
2. Clinical features of the disease with concentration of chloride >60 mmol·L^{-1} at the sweat test or a concentration in the intermediate range (30–59 mmol·L^{-1}) but two disease-causing CFTR mutations.
3. CFTR genotype is undefined: CFTR physiologic tests, such as nasal potential difference and intestinal current measurement, should be performed.

MANAGEMENT

1. CFTR modulator therapies
2. Airway clearing techniques
3. Chest physical therapy
4. Humidification with sterile water or normal saline to facilitate airway clearance
5. Antibiotics
6. Mucus thinners
7. Lung transplantation

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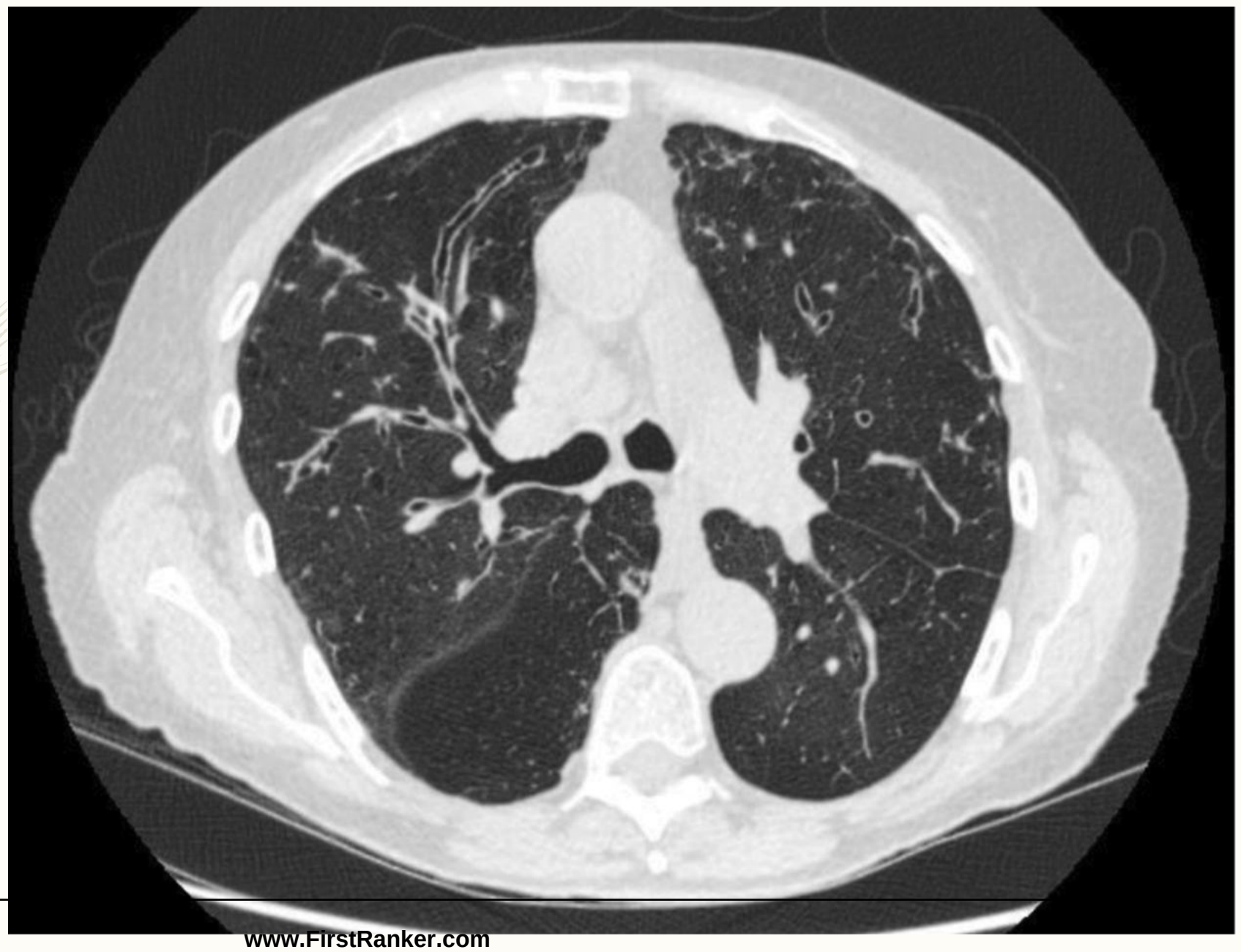
CASE 2

- 45-year-old farmer with asthma since childhood.
- Complaints: Decline in his exercise tolerance and an increase in cough which has become productive of purulent sputum with occasional thick/solid components.
- Respiratory exacerbations not responding well to standard steroid and antibiotic treatment.
- He was noted to have variable pulmonary infiltrates on chest radiographs during these episodes



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INVSETIGATIONS

- Marked peripheral blood eosinophilia
- Total IgE > 1000 IU/ ml
- Aspergillus specific IgE > O.35

ABPA: ABPA is an inflammatory disease caused by hypersensitivity to the ubiquitous fungus Aspergillus fumigatus

- ABPA occurs most commonly in patients with asthma and CF
- ABPA is the cause of 1–10% of cases of bronchiectasis
- Most ABPA cases occur in the third and fourth decade without a sex predilection.

DIAGNOSIS

- Long standing uncontrolled asthma/ Cystic fibrosis
- Brownish sputum
- Peripheral eosinophilia > 500/ mm3
- Total IgE > 1000 IU/ ml
- Specific IgE for A. fumigatus > 0.35

HRCT thorax:

- Central bronchiectasis
- High attenuation mucus
- Finger in glove/ TIB
- Tram track
- Mosaic attenuation

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MANAGEMENT

1. Corticosteroids
2. Antifungals
3. Airway clearing techniques
4. Chest physical therapy
5. Mucus thinners

CASE 3

- 77-year-old retired librarian.
- Cough for many years with new symptoms of fatigue, weight loss and fever.
- A chest CT scan was performed looking for a possible occult malignancy and bronchiectasis was found.

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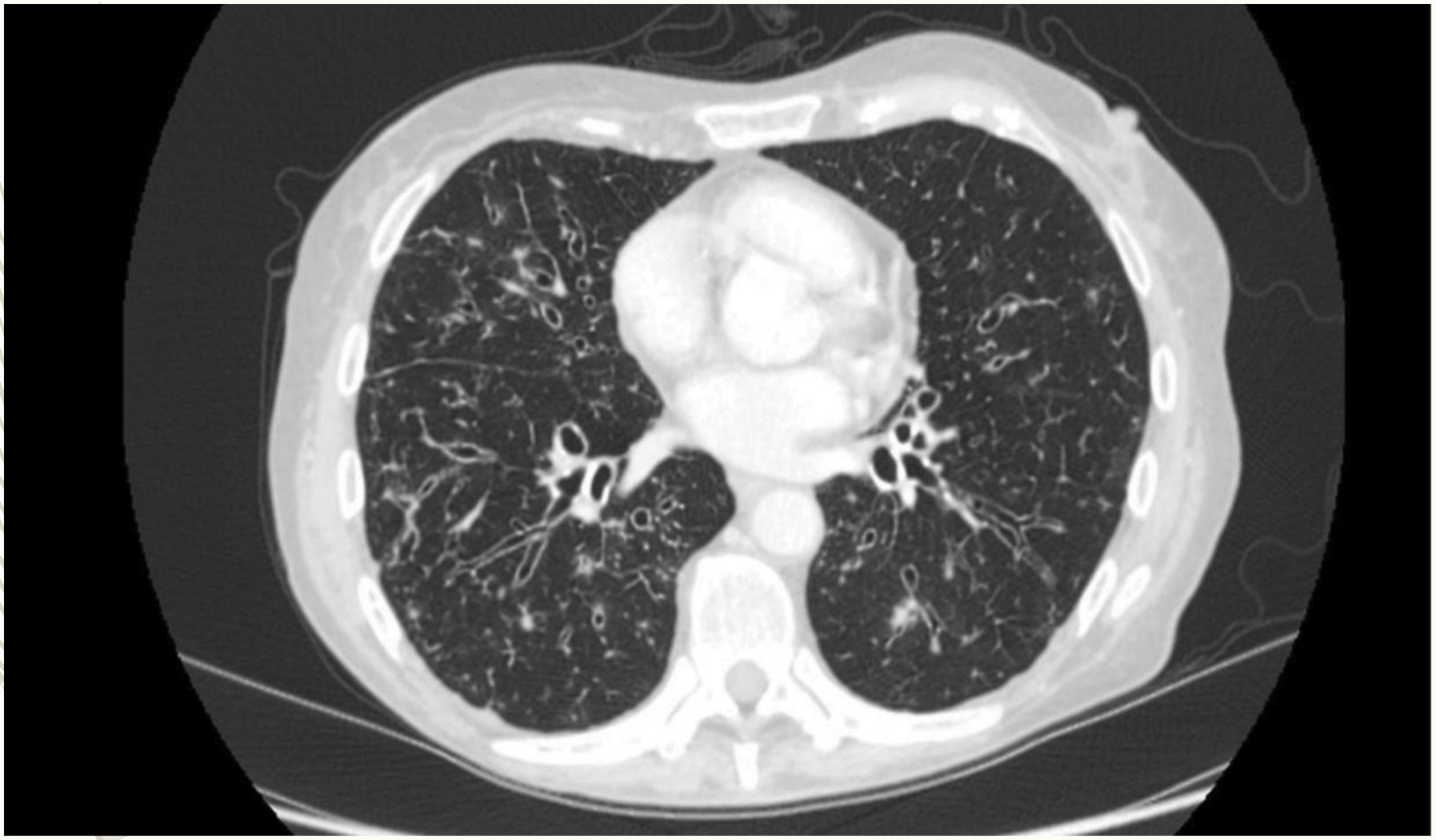

DIAGNOSIS

- HRCT thorax: cylindrical bronchiectasis and tree-in-bud pattern in middle and lower lobes
- Sputum for M. Tuberculosis: negative
- MGIT culture: MAC growth at 4 weeks
- Repeat MGIT: Positive for MAC
- Tests for immunodeficiency and ABPA: Negative

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MANAGEMENT

1. Management of NTM as per the organism and clinical picture
2. Airway clearing techniques
3. Chest physical therapy
4. Mucus thinners

CASE 4

- A 66-year-old woman with established idiopathic bronchiectasis has had three to four exacerbations per year for the past 3 years despite performing daily chest physiotherapy.
- Produces large volumes of sputum daily despite performing the active cycle of breathing technique.
- Testing for NTM, ABPA and other complications were negative, but sputum shows persistent infection with *P. aeruginosa*.

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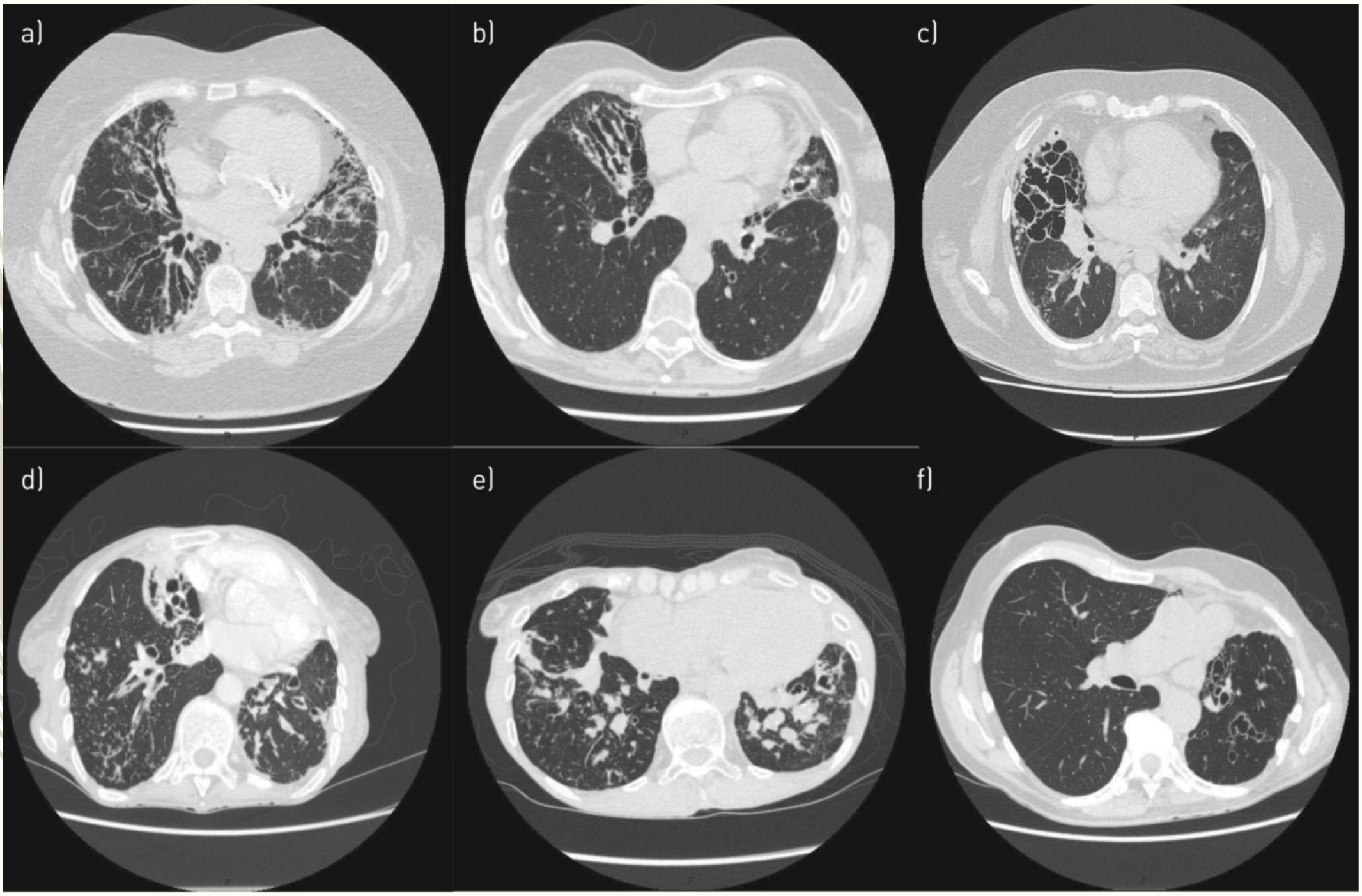

- One of the most common presentations of bronchiectasis
- Exacerbations are one of the most important manifestations of bronchiectasis and *P. aeruginosa* is the most frequent organism in severe bronchiectasis worldwide
- Cylindrical bronchiectasis is the most common morphological pattern identified on CT scans

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MANAGEMENT

1. Review current airway clearance regime.
2. Repeat sputum microbiology and repeat testing for NTM, ABPA and ensuring the all possible treatable causes and comorbidities have been identified.
3. First-line recommendation for *P. aeruginosa* with frequent exacerbations is an inhaled antibiotic.

THANK YOU

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