



# DIAGNOSIS OF ASTHMA & RESPIRATORY PROBLEM

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**چهارمین کنگره دوسالانه**  
**استاد امیر حکیمی**  
The 4<sup>th</sup> Pediatric Congress  
Professor Amirhakimi  
FARS SHIRAZ  
۱۴۰۳ اردیبهشت ۲۵

بزرگوارکننده:  
انجمن متخصصین کودکان استان فارس  
گروه کودکان دانشگاه علوم پزشکی شیراز

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مجری برگزاری: **زوسپا**





4<sup>th</sup>  
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کودک ۷ ساله بدلیل سرفه خشک مزمن از ۶ هفته پیش  
مراجعه کرده است در طی شب و صبح سرفه دارد. سرفه  
در فعالیت بیشتر است. سابقه اکزما و ابریزش طولانی بینی  
دارد. مادر وی به آسم مبتلا است.





- ***A 7 m-o baby with cough since birth time .***
- ***PE: wheeze and crackle***



- ***A 13 y-o girl with cough since 1 mo ago .no fever.***
- ***PE: finding is in inspiration, other PE is normal***



- ***A 2 y-o baby with sever cough since 5 mo ago.***
- ***The onset was abrupt***
- ***Bilat harsh B.S. & wheeze***

- ***A 10 y-o boy with sever dry cough since 5 mo ago. ,***
- ***croupy, no during sleep,***
- ***PE is normal,***
- ***no response to Tx -***
- ***Cray is nl,***





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## ***pediatric asthma***

- ***6.8 million children in the USA***
- ***13.8 million days School absence***
- ***social and economic burden***



- *2019:262 millions; 3416/100000: 455000 death*
- *Models suggest: 2023 an additional 100 millions people*
- *Prevalence in Europe :2% to 6% , 17.7 billion Euro/y in E*
- ***In USA 81.9 b.\$***
- *Totally :300 b. directly  
& 963. b\$ indirectly*



## *Asthma in children is challenging*

*1- natural course and risk Factor*

*2- difficult evaluation*

*3- phenotypes of wheeze*

*4- lung growth*

*5- which drug is useful  
for diff. types of wheeze*





- ***Typical signs & symptom of asthma :***  
***wheeze- shortness of breath, dyspnea– chest tightness- cough***
- ***Variable time & intensity***
- ***More at night or in awaking***
- ***Exercise- laugh- cold-***
- ***allergen, URI***
- ***Better after bronchodilator***
- ***FEV1, FEV1/FVC, DIURNAL VARIABILITY,***

## ***Tacson study:***

### ***Wheezing phenotypes :at 3-y/o &6-y/o***

- ) transient early wheezer, onset, 20%.... beginning before 3-6y/o, resolve by 6 y/o***
- ) persistent, 14%, before 3 y/o, continues at 6 y/o***
- ) late onset, 15%, begin 3-6y/o***

## ***Transient early wheezer***

- ***Before 3 y/o, 60% improved by 6-y/o.***
- ***No relation to atopy.***

### ***Risk factors :***

- ***Older sibling (school age)***
- ***Day care***
- ***Allergens in the house***
- ***Male gender***
- ***Bottle fed***
- ***However, 25% of transient w. continue to wheeze in adolescence***



## ***IgE associated persistent wheeze***

- ***20% of wheeze under 3 y/o***
- ***The first symptom before 1-y/o***
- ***Lung function decreased by 6 year old***

### ***Risk factors:***

- ***male***
- ***parental asthma***
- ***Atopic D.***
- ***high Eosinophil at 9 m/o***
- ***wheeze with lower RTI***
- ***early sensitization to food or aeroallergens***



# Asthma

*Why wheeze is frequent in infants?*

- *Trachea & bronchi are more compliant*
- *Peripheral airway resistant is high*
- *Lack of elastic recoil : airway closure*
- *Compliant chest*
- *Diaphragm*



# Wheeze

- *About 30% : wheeze during 1<sup>st</sup> 3 years*
- *1) the most common type : episodic viral disease, no interval symptom, may be sever, improves with age*
- *2) multiple trigger wheeze( resemble classical asthma): URI, interval symptom(cold- activity- laughing- crying)*
- *Congenital disorder(CF- ciliary dyskinesia- BO..)*



# Asthma

*During last 50 years: a question:*

- *Is viral induced wheezy bronchitis is asthma?*
- *Broad spectrum of wheeze in young children : school age : resolve*
- *Clinical epidemiologist : these two conditions are different*
- *In some infants ; Happy wheezer: wheeze in playing & activity, no in sleep, good appetite, no distress(no need Tx)*
- *Other respiratory sounds are mislabeled by parents as wheeze*

# ***Risk factors for asthma development in children***

- ***Allergic sensitization is key point of persistent asthma***
  - : alternaria sensitization related to asthma in the future***
- ***Gender: boys 1.5 fold***
- ***Total IgE***

## *modified asthma predictive index*

*1-history of 4 or more episodes with at least one physician diagnosed*

*one major*

*Two minor*

### *major criteria*

- *parental history of asthma*
- *atopic dermatitis*
- *allergic sensitization to at least 1 aeroallergen*

### *minor criteria*

- *allergic sensitization to milk- egg or peanut*
- *Wheeze unrelated to colds*
- *- blood eosinophil >4%*



- *A cohort study in young children : wheeze were significantly associated with bacterial infections with the same frequency of viruses*
- *Moraxella c. – St Pneumonia are common in asthma in children*
- *Therapeutic use of antibiotics in wheeze*
- *3 days Azithromycin : control the wheeze( anti inflammatory or antibiotic)?*

## ***Viral & bacterial RTI***

- ***RSV\_ Rhinovirus- Influenza- Para I- metapneumovirus: recent wheeze***
- ***50% of children with RSV bronchiolitis : asthma at 6 y-o***
- ***Rhinovirus : the most frequent of asthma exacerbation in young & older children & related to development of asthma in later childhood***
- ***Virus : immune response toward asthma or Atopy predispose to viral infection?***
- ***( Recent data : allergic sensitization predisposes to viral infection)***



## *Sign & symptom*

- *Exposure to virus or mycoplasma- chlamydia : increase hyperresponsiveness to cold, dry air*
- *AR-AC-FA-AD- parental asthma – wheeze apart cold : support dx*
- *Attack : wheeze , B/S,*
- *crackles(inflammation- secretion)*





# Diagnosis

- + *Hx*
- + *Timing of wheeze (acute or chronic)*
- + *Viral and feeding relation*
- + *Family hx & atopic past Hx*
- + *Co-morbid condition*
- + *Response to previous treatment*

## ***DX***

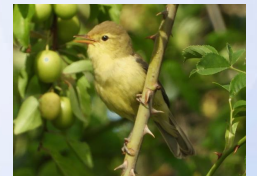
- ***PE of chest is often nl***
- ***Up & lower RT – skin***
- ***Wheeze improvement with salbutamol***
- ***Unilat. wheeze( FB- pneumothorax)***
- ***Sinusitis: purulent PND***
- ***FTT( ID-CF-CHD)***
- ***Clubbing (CF)***
- ***Neurological deficit (Aspiration)***



## ***Radiography***

- ***First line evaluation of a child with recurrent wheeze : should : CxRay (infilt.-mass-great vessels- FB)***
- ***Mild asthma : nl***
- ***Hyperlucency- flat diaphragm- Ap diameter- horizontal position of rib- peribronchial thickening – Atelectasis ( Rt middle lobe syndrome,***

***CXRays are not routine in attacks unless : infection- pneumothorax- atelectasis***





## ***Radiography***

- ***Ba swallowing  
vascular ring –  
micro aspiration***
  
- ***CT of chest :***
  1. ***mass***
  2. ***LN***
  3. ***bronchiectasis***
  4. ***remodeling***



# ***Pulmonary Function Test***

- ***PEF; asses control of asthma( PE is more important***
- ***Effort dependent***
- ***Spirometry: For any child >4y/o for diagnosis of asthma or management***
  
- ***FEV1 ,FEV1/FVC pre & post bronchodilator (10-12% increases)***
- ***FE25-75% >25% increase)***



## *Diagnosis*

- *Body plethysmography*
- *infant PFT-*  
*Impulse Ossilometry*
- *Bronchial provocation ( methacholine- cold air-  
Exercise-)*





***FeNO airway inflammation, may be useful  
,non-invasive diagnostic tool***

***may diagnose***

***1- asthma in children***

***2- response to ICS in children***



*American Thoracic Society: **FeNO:**  
Eosinophilic inflammation (high T2) - CS response –  
-airway inflammation: CS using? - Adherence to CS using*

*In children  $FeNO > 35$  part /billion ppb: eosinophilic airway  
inflammation & likely response to **ICS***

***Under 20 ppb : unlikely eosinophilic inflammation: no  
response to increase dose of ICS***

## LAB

- *Eosinophilia(sputum>3%, blood>150-300)-IgE- FeNo>25*  
*- PFT*
- *Aeroallergen sensitization*
- *Immune work up (infections)*
- *Sweat chloride test*
- *Bx( ciliary dyskinesia)*
- *BAL(infection*
- *PPD (TB)*



## *Allergic specific IgE*

- *children are at risk for development of asthma, sensitized to aeroallergen*
- *In vitro: ELISA*
- *In vivo : skin prick test*



# Asthma

- *Asthma is not a single disease : asthma syndrome*
- *Dx is clinical*
- *Wheeze is not asthma , a lot of clinicians , get wheeze diagnosed as asthma*





# Asthma

- *Red flags:*
  - Clubbing*
  - Cyanosis*
  - Anemia*



## ***DX***

### ***Sign & symptom***

- ***Wet cough : bronchiectasis- protracted bacterial bronchitis- aspiration- C. dyskinesia-CF***
- ***Vomiting : GERD***
- ***Dysphagia : swallowing problem***
- ***Breathlessness+ tingling: panic – dysfunction***
- ***Stridor : laryngeal (VCD- vascular ring)***
- ***Abnl voice, croupy, or abnl crying: laryngeal problem, vascular ring***
- ***Focal sign : FB- developmental anomaly...***
- ***Persistent wheeze: Vascular ring – LN- T.bronchomalacia- FB- mucous plug***



*Hx*

*symptom from birth :*

*CLD of prematurity- ciliary dyskinesia- CF- immune deficiency*

- *Family hx: lung dis.: CF , neuromuscular dis.*  
*, ciliary dyskinesia*

# Asthma??

- *Younger children (<12mo)*
- *Isolated chronic cough ( no wheeze)*
- *Sudden onset , no trigger –*
- *absence of nocturnal cough is unusual in asthma  
( may vocal c. dysfunction- habit cough)*
- *Children no response to asthma medication*
-

## GERD

- *nocturnal cough*
- *GERD can present as chronic cough or recurrent wheeze*
- *It could be co-morbid with asthma*
- *GERD in : Infant with wheeze ; no URI or other triggers*
- *Wheeze is more in supine- night – after feed*
- *Vomiting – acid harsh*
- *Poor response to Tx*





## Upper Airway Cough Syndrome

- *Allergic rhinitis & sinusitis & tonsils & adenoid*
- *Mechanism: PND? ,airway inflammation & sensory neural hypersensitivity theory*

*Should be suspected in*

- *Wet cough+ absence wheeze*
- *Early part of night when supine & early morning when wake up*
- *cough between 1-4 AM*
- *With AR*
- *Poor response to asthma med*

# Cystic Fibrosis

- *Early childhood*
- *Recurrent infections*
- *Malabsorption*
- *often CF pts have asthma too*

*CF should be suspected in:*

- *Persistent wet cough*
- *Recurrent chest infections*
- *Clubbing & FTT*
- *Sinusitis*
- *Malabsorption*



# Asthma mimickers: Protracted Bacterial Bronchitis

- *An underdiagnosed condition*
- *Persistent wet cough more than 4 wks*
- *Hallmark: good response to antibiotics- nl growth- nl PFT*  
*- early phase of suppurative lung dis & bronchiectasis*

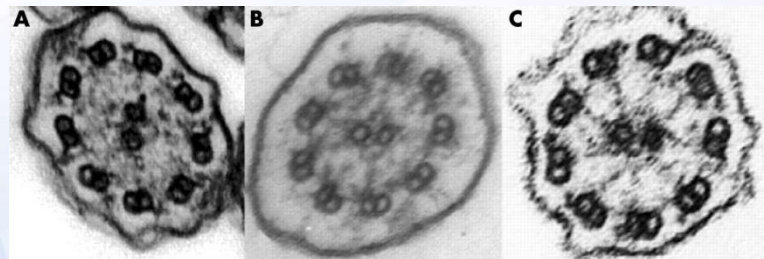
## *In these conditions:*

- *Persistent cough more than 4 wks*
- *No another chronic lung dis*
- *Good response to antibiotics*
- *No wheeze- no response to bronchodilator*
- *Dx is clinical but BAL may be helpful – long Tx*



# Primary Ciliary Dyskinesia

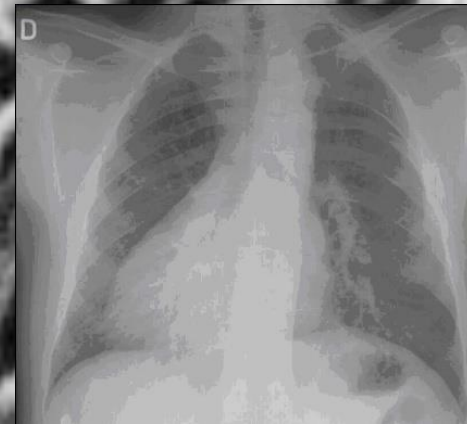
- *very early onset symptoms*
- *Hx of congenital pneumonia*
- *Chronic rhino-sinusitis*
- *Recurrent OM*
- *Chronic wet cough*



# Primary Ciliary Dyskinesia

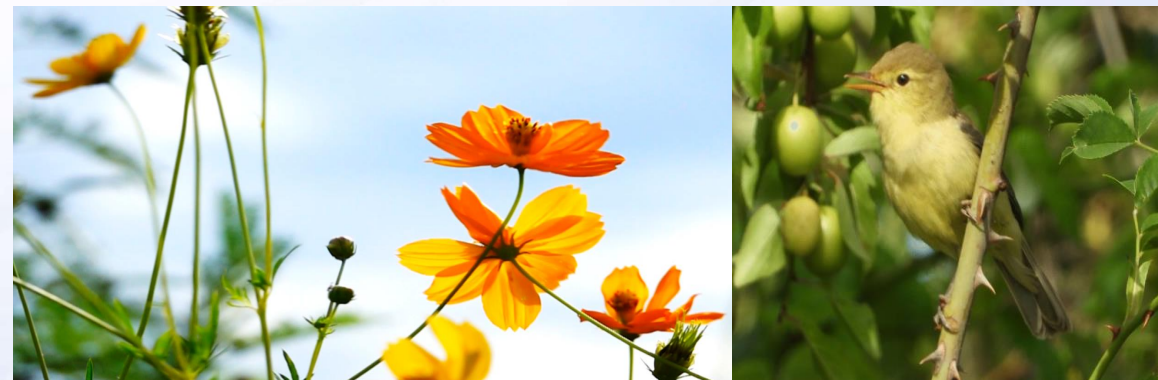
Should be considered in :

- *Chronic wet cough & recurrent lung infection*
- *Chronic upper airway involvement with chronic rhino-sinusitis & OM*
- *Early clubbing*
- *Hx of early onset symptom almost from neonatal period*
- *Association with dextrocardia*



# Habit cough

- *No response to asthma Tx*
- *More common in 8-14 y-o*
- *Rhythmic cough, croupy, increase when the parents describe the cough*
- *May have background of asthma*
- *No at night*
- *NI PE*
- *No response to bronchodilator*
- *No investigation is needed*
- *Suggestion therapy*





# Airway Foreign Body aspiration

- *Under 4 y-o*
- *Endogenous or exogenous*
- *highly suspicious, Chocking*
- *Cough, wheeze –distress : typic*
- *Collapse or ball valve*
- *Abrupt localized wheeze*
- *Monophasic wheeze*
- *Abnl chest*
- *No response to Tx*
- *bronchoscopy*



# Tracheo-bronchomalacia

- *Collapse*
- *Congenital or acquired (after intubation- vascular ring-TEF)*
- *In newborn : stridor – inability to extubate*
- *loud cough*
- *After URI*
- *May be with loud wheeze increase in playing and decrease when sleep*
- *Resolve 2-3 y-o*



# Traceo-bronchomalacia

## Should be considered in

- *Monophasic wheeze*
- *Wheeze more than 10-14 days*
- *wheeze worse : awake and active*
- *Poor response to bronchodilator*
- *Paradoxical worsening after SABA*
- *Stridor*
- *Hx of TEF or vascular ring*
- *Dx is clinical - Flexible bronchoscope-*
- *Tx: atrovent- stent aortopexy*



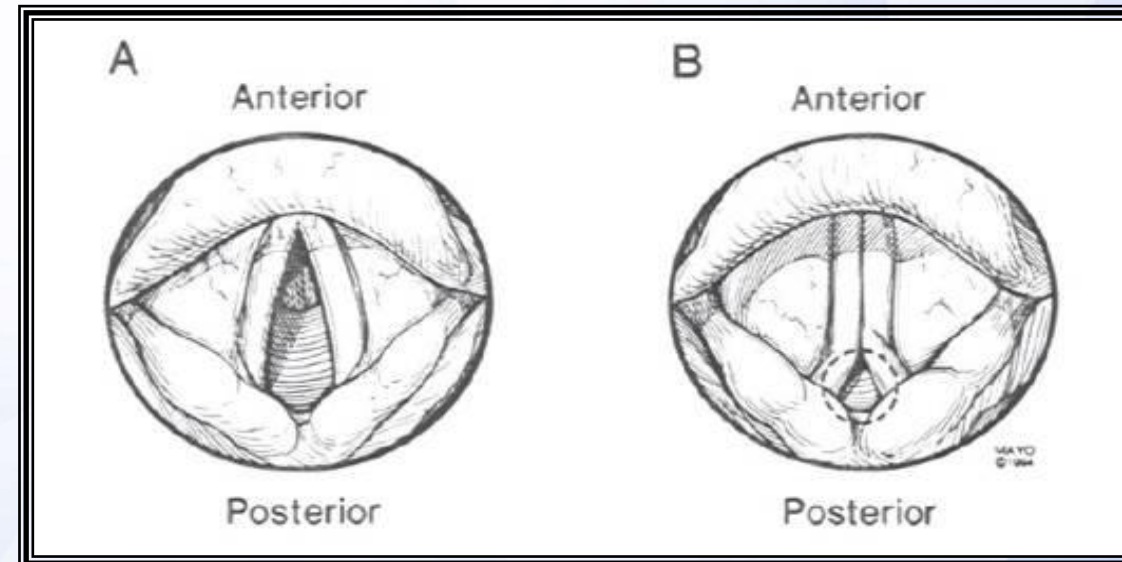
# Bronchiolitis obliterans

- *Adenovirus- first 3 years of life*
- *Persistent & worsen with viral infection*
- *Post transplant is aggressive, but post infection is slowly*
- *Fixed airway obstruction*
- *no response to 2 wks CS*
- *Mosaic pattern on CT*



# Vocal cord dysfunction

- *Adduction during inspiration*
  - *Over 10 y-o*
  - *Before dx : asthma but no response to drugs*
  - *Dyspnea , stridor, wheeze*
  - *Provoke with stress*
- 
- *3 types: psychogenic- EI*  
– *chemical& irritant trigger*



# Is suspected in **Vocal cord dysfunction**

- *Sudden worsening*
- *No response to asthma medication*
- *No at sleep*
- *Monophasic wheeze(is heard more over the neck)*
- *Abnl PFT in 25 %*
- *Dx is by exclusion & is clinical*
- *Bronchoscopy-*
- *Tx: speech therapy*





## **Exercise Induced Breathlessness**

- *Is a component of asthma, rarely isolated entity*
- *Shortness of breath and dyspnea resolve 1-2 min stopping sport*
- *Absence of cough or wheeze*
  
- *Well response to bronchodilator or resolve 15- 20 min spontaneously*
- *Df dx VCD- CVD*



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Asthma(1

CF (2

FB(3

VCD(4



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- ***croupy, no during sleep, PE is normal,***
- ***no response to Tx - Cray is nl,***

***Asthma(1***  
***habitual (2***  
***FB(3***  
***VCD(4***



# *Diagnostic biomarker for eosinophilic asthma*

- *Sputum eosinophil count: 2-3% (time, induction?: so researcher : another biomarker of Eosinophilic inflammation)*
- *Blood E count >150, or >300 or >400?*
- *Eosinophil driven **neurotoxin**(EDN) correlate with eosinophil activation (Benralizumab)*
- *Eosinophil **peroxidase** (EPO): release by eosinophil, IgE dependent*
- ***FeNo** : fraction of exhaled No >25 part/billion: eosinophil airway inflammation : can predict responsiveness to CS*
- ***FeNo + blood eosinophil: optimize management asthma***

