Review Article

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Consensus Report on Management of Wheezing in Preschool Children, Hong Kong Society of Paediatric Respirology

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Abstract

Objective: *To review the literature on the clinical problem of recurrent wheezing in children and providing suggestion for the treatment of this problem based on the currently available evidences.* ***Data sources and extraction:*** *Literature search using Medline, Pubmed and the Cochrane Library up to March, 2010, using the terms "recurrent wheezing", "preschool children", "viral induced wheeze" and "multiple trigger wheeze".* ***Study selection:*** *A total of 38 original papers and review articles were selected for inclusion in this review.* ***Data synthesis:*** *Parent reported wheezing may represent a heterogenous condition while doctor-confirmed wheeze is more specific and exhibit greater airway resistance. In Hong Kong, there had been more than 5000 preschool children admitted for acute wheezy attack in the recent few years. Wheezing can be classified into different phenotypes according to its epidemiological characteristics or clinical features. Classification of recurrent wheezing into episodic viral wheeze and multiple trigger wheeze provides a practical framework for treatment. The treatment of the condition would include the bronchodilator, inhaled corticosteroids, and / or leucotriene receptor antagonist. The choice of treatment will depend on the clinical phenotypes and other clinical factors. The main effect of inhaled corticosteroids is symptomatic control rather than disease modification.* ***Conclusions:*** *Recurrent wheezing in preschool children is a common clinical problem. Classification of recurrent wheeze into episodic viral wheeze and multiple trigger wheeze enables us to manage the condition with the treatment of inhaled corticosteroids and / or leucotriene receptor antagonist or the combination.*

Keywords: Multiple trigger wheeze, Preschool children, Recurrent wheezing, Viral induced wheeze

Introduction

Recurrent wheezing is a common clinical problem facing the paediatricians. Overseas studies showed that about one third of the preschool children had intermittent wheezing before three years of age, and almost 60% of the children would experience the same problem by the ages of six years.[1,2] In Hong Kong, a total of 5,428 cases of acute wheezy attack (with the diagnoses of asthma, acute bronchitis or acute bronchiolitis) under or equal to the age of six years, which accounted for about 10% of all acute admission, were admitted to the hospitals under Hospital Authority in 2009 (Figure 1). The number of admissions had shown a steady increase trend from the year 2004-2008, but a slight drop in the year 2009. This may be accounted by the epidemic of human swine influenza in year 2009 causing less admission and improvement in hygiene (Figure 2). The wheezing episodes are commonly triggered by an upper respiratory tract infection, with a pattern of episodic wheezing with the child being asymptomatic in between. This is termed ***episodic viral wheeze***.[3] Some children especially those with atopy will have recurrent wheezing with multiple triggers, including viral infection, exercise, exposure to smoke, allergens, or cold airs, i.e. symptomatic in between viral infections. This clinical phenotype is termed ***multiple trigger wheeze***.[3]

Although there is an association between wheezing before the age of three years and asthma at school age,[1,4-6] only a minority of early wheezer remain symptomatic in adolescent or adulthood.[7-9] In fact, majority of the early wheezers outgrew their problem

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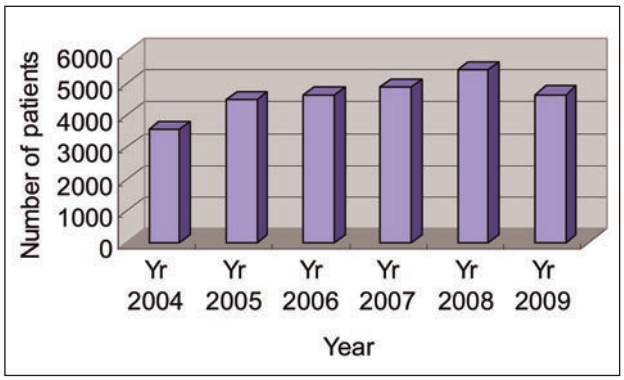

Figure 1. Total number of patients with acute wheezy attacks </=6 years old in year 2004-2009.

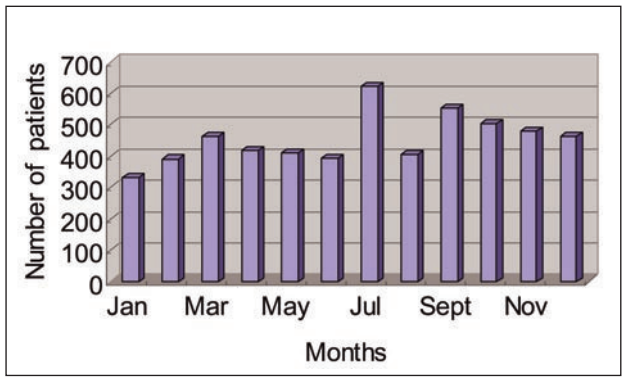

Figure 2. Monthly admissions of acute wheezy attack in children </= 6 years old in 2008.

during childhood.[1,7,8,10] Currently, there is a lack of evidence that the pathophysiology of preschool wheezing illness is similar to that of asthma in older children.

The purpose of this consensus report is to provide updated suggestions for the treatment of wheezing in preschool children based on the currently available evidence.

Methods

Literature search by Medline, Pubmed and the Cochrane Library up to March 2010, using the terms "recurrent wheezing", "preschool children", "viral induced wheeze" and "multiple trigger wheeze". A total of 38 original papers and review articles were selected for inclusion in this review. Expert panel meeting convened by Hong Kong Society of Paediatric Respirology (HKSPR) was held for three times, and different areas of the problem were presented for discussion by panel members. Consensus was derived following the foresaid discussion and the controversial aspect was put up for survey. The questionnaire survey by the expert panel of HKSPR was conducted among participants of the Annual Scientific Meeting of HKSPR in 2010 and the results were included.

What is wheeze?

Medically, wheeze is defined as a continuous high-pitched sound with musical quality emitting from the chest during expiration.[11] On the other hands, parent reported wheezing may have the meanings of noisy breathing, repeated or prolonged coughing, phlegmy cough, respiratory distress, or symptoms of upper respiratory tract infection. Not surprisingly, all those children with the above symptoms will be misinterpreted as having wheezing and lead to an incorrect diagnosis of asthma. If possible, wheeze should be confirmed by a health care professional.[12] In fact, children with doctor-confirmed wheeze exhibit greater airway resistance than children with only reported wheeze.[13]

The diagnoses of "recurrent wheezing" vs "asthma"

In a survey among paediatricians attending the Annual Scientific Meeting of HKSPR in 2010 showed that around 46% out of 35 doctors would only make the diagnosis of asthma after five years of age whilst around 54% would make the asthma diagnosis before five years of age. Further data collection may be needed to clarify the situation. We acknowledged this and arbitrarily chose "recurrent wheezing" with the consensus arrived at within the panel.

Clinical approach to preschool children with recurrent wheezing

Most preschool children with wheeze do not require any investigations. Children with typical and atypical wheeze may have characteristic clinical features and physical findings (Figure 3). The differential diagnoses of atypical wheeze will include upper airway abnormalities, gastro-oesophageal reflux, bronchopulmonary dysplasia, pulmonary oedema secondary to cardiac disease, foreign body aspiration, tuberculosis, and other causes of pulmonary suppuration. A chest X-ray should be performed and the patient referred to the specialist.

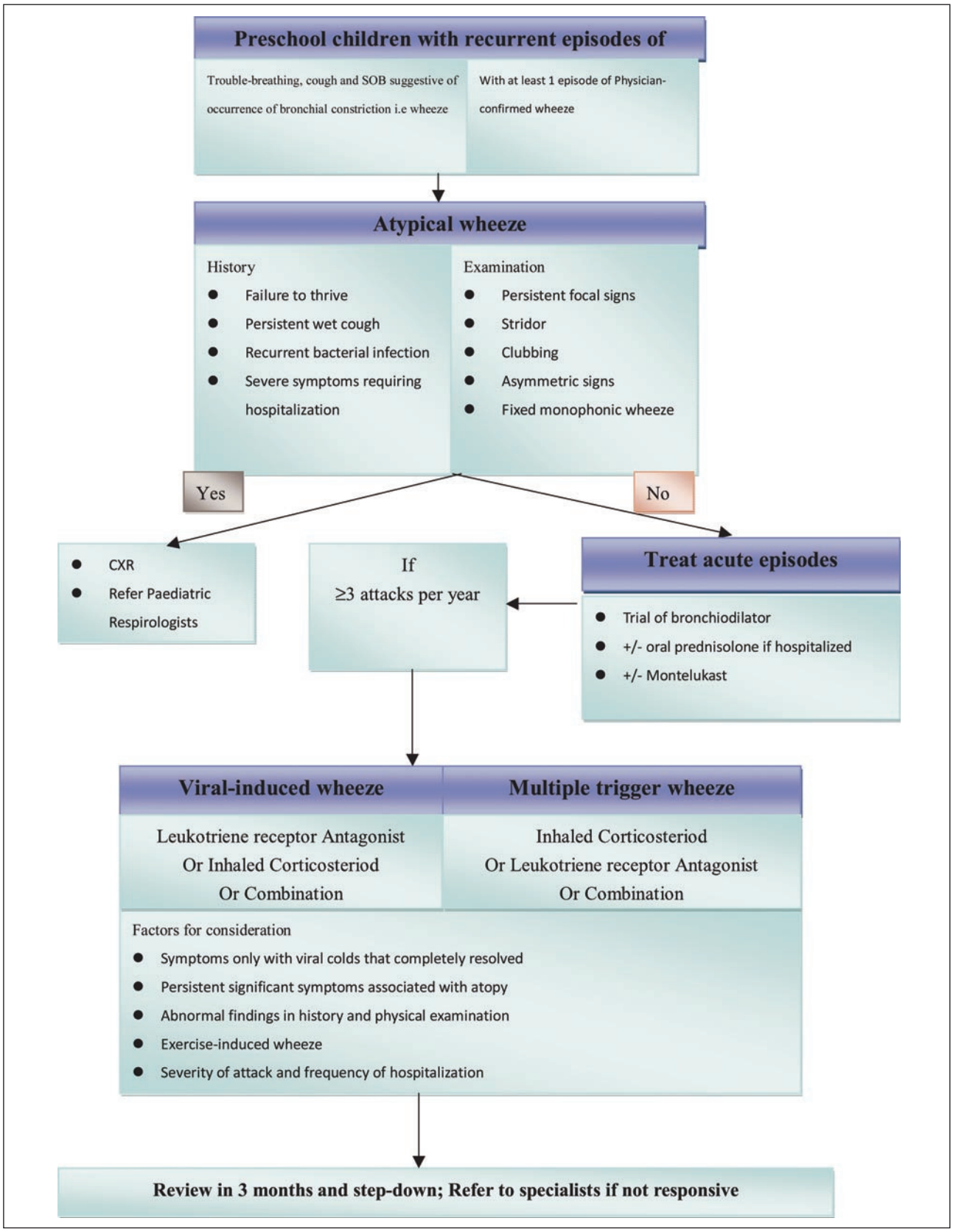

Figure 3. Consensus in Management of recurrent wheezing in preschool children.

Different wheezing phenotypes

Wheezing can be classified by into different phenotypes according to its epidemiological characteristics or clinical features. A phenotype may be considered as a cluster of either clinical or pathological features which tend to be associated, and which are useful in some way, such as in managing the child or understanding the mechanism of disease.[14]

Epidemiological phenotypes

The Tucson study[15] identified preschool wheezing as four phenotypes:

a. Transient early wheezing
b. Late onset wheezing
c. Persistent wheezing
d. No wheeze

a. *Transient early wheezing*
   In the Tucson birth cohort, 34% of children wheezed during the first three years of life but 60% of these had ceased to wheeze by the age of six years. These children were not more likely to have a family history of asthma, atopic dermatitis, eosinophilia, high level of IgE, or any early markers of atopic diathesis. Lower levels of lung function before any lower respiratory tract infection developed, maternal smoking during pregnancy and a younger mother, were the risk factors for this condition of transient wheezer. The lower levels of lung functions of these children improved with time but did not catch up with those of children who never wheezed during their growing years.
b. *Late onset wheezing*
   In the Tucson birth cohort, 15% of children who started wheezing after the age of three years were still wheezing at the age of six years. They were defined as having late onset wheeze. This was associated with maternal asthma, male sex and a history of rhinitis. This group tended to be atopic and show normal lung function at birth and through the teenage.
c. *Persistent wheezing*
   Children who wheezed in the first three years and continued beyond the age of six years were termed persistent wheezer. It accounted for 13.7% of children among the Tucson birth cohort. This was associated with normal lung function during the first year of life, but reduced lung function from the preschool age period and through adulthood, with atopy and a family history of asthma.
d. *No wheeze*
   Up to 51.5% of children in the Tucson birth cohort did not have any wheeze by the age of six years.

The phenotypes used in epidemiological studies can only be applied retrospectively. It improves the understanding of the mechanism and the natural history of the problem. It tells us about what happens to wheezing in the medium and long term, but it is not useful clinically.

Clinical phenotypes (temporal patterns of wheeze)

a. Episodic viral wheeze
b. Multiple trigger wheeze

a. *Episodic viral wheeze*
   Episodic viral wheeze is defined as wheeze in discrete episodes, with the child being well between episodes. This is the most common phenotype in the preschool children. It is usually associated with clinical evidence of a viral respiratory tract infection. The microbiological agents included rhinovirus, respiratory syncytial virus (RSV), coronavirus, human metapneumovirus, parainfluenza virus and adenovirus. Episodic viral wheeze mostly commonly declined over time, disappearing by the age of six years. However, other children may continue to have episodic wheeze into school age with subsequent remission, and some children may change into multiple trigger wheeze.
b. *Multiple trigger wheeze*
   Multiple trigger wheeze is defined as wheezing that shows discrete exacerbations with viral respiratory tract infection, but also symptoms between episodes. Other triggers of wheezing include tobacco smoke, allergen exposure, crying, laughter or exercise. Multiple trigger wheeze reflects chronic allergic inflammation and could be evolved into asthma.

Both phenotypes may vary with time and treatment. Episodic viral wheeze may evolve into a multiple trigger phenotype, or treatment of multiple trigger with inhaled corticosteroid may revert the wheeze into an episodic pattern.

The practical advantage of classification into clinical phenotypes is that it can be determined at the time of presentation allowing a practical framework for treatment. In this consensus report, the wheezing in preschool children is categorized as viral induced or multiple trigger wheeze.

Can inhaled corticosteroid modify the natural course of the disease?

There are 3 recent studies which address the above question.

In the Prevention of Early Kids (PEAK) study,[16] 285 children aged two to three years with a positive asthma predictive index, were randomly assigned to treatment with fluticasone propionate 88 microgram twice daily or placebo for two years. It was followed by one year period without study medications. During the third year, there were no significant differences between the two groups in the proportion of episode-free days, the number of exacerbations, or lung function. Nevertheless, use of inhaled corticosteroid was associated with a greater proportion of episode-free day, a lower rate of exacerbation and of supplementary use of controller medication during the treatment period.

In the Inhaled Fluticasone in Wheezy Infants (IFWIN) study,[17] young children who had at least one atopic parent, was followed prospectively and randomized after either one prolonged (>1 month) or two medically confirmed wheezy episodes, with fluticasone propionate 100 microgram twice daily. The dose of the study drug was reduced every three months to the minimum needed. If the symptoms were not under control by three months, open-label fluticasone propionate 100 microgram twice daily was added to the treatment. Children were followed-up and evaluated up to five years of age. At five years of age, the two groups did not differ significantly in the proportion of children with current wheeze, physician-diagnosed asthma or use of asthma medication, lung function or airway reactivity.

In the Prevention of Asthma in Childhood (PAC) study,[18] the hypothesis of the use of intermittent corticosteroid triggered by episodes of "pre-asthma" in the prevention or delay progression to persistent wheezing, was tested in a cohort of infants with recurrent wheezing, whose mothers had received a diagnosis of asthma. One-month-old infants who had three days' episode of wheezing were randomized to receive budesonide 400 microgram twice daily or placebo for two weeks, and were prospectively followed for three years. A total of 411 infants (294 in the budesonide group and 117 children in the placebo group) were enrolled. The proportion of symptom-free days was 83 percent and 82 percent respectively. Twenty-four percent of children in the budesonide group had persistent wheezing, as compared with 21 percent in the placebo group, and the finding was unaffected by the status of atopic dermatitis.

In summary, neither continuous nor intermittent inhaled corticosteroids modified the course of preschool wheezing, even in infants who were in a high risk group for disease progression.

Symptomatic treatment of episodic viral wheeze

Inhaled or oral intermittent short acting beta-2 agonist

Inhaled short acting beta-2 agonists (e.g. salbutamol and terbutaline) are the most effective bronchodilators available, and therefore, the drugs of choice for acute symptoms of wheeze. Double-blinded placebo controlled studies have demonstrated significant bronchodilatory effects[19-22] and protective effects against bronchoconstrictor agents[23,24] in infants and preschool children treated with rapidly acting beta-2 agonist. Oral administration of short acting beta-2 agonists is also effective but is limited by systemic side-effects.[25]

Inhaled intermittent anti-cholinergics

In the Cochrane Review it was concluded that inhaled ipratropium may be beneficial in older children over two years of age[26] but there is no good evidence in preschool children below two.[26] There are no important side effects.

Intermittent use of oral leukotriene receptor antagonist

Montelukast sodium, a specific leukotriene receptor antagonist, had been shown to be effective in children with mild persistent asthma and is one of the preventive agent for this group of children. The drug has rapid onset of action and maximum clinical benefit can be achieved within the first 24 hours. In a multicentre, randomized, doubled-blinded and placebo-controlled trial, Robertson et al[27] shown that introducing a short course of montelukast at the first signs of an upper respiratory tract infection or asthma symptoms, can subsequently modify the severity of the acute episode of asthma. In the study, 220 children were randomized 107 to montelukast and 113 to placebo. Treatment with montelukast was initiated by parents at the onset of each upper respiratory tract infection or asthma symptoms and continued for a minimum of 7 days or until symptoms had resolved for 48 hours up to a maximum of 20 days. The montelukast group had 163 unscheduled health care utilizations for asthma compared with 228 in the placebo groups (p=0.007). There was a non-significant reduction in specialist attendances and hospitalizations, duration of episode, and beta-agonist and prednisolone use. Symptoms were reduced by 14% and nights awakening by 8.6% (P value=0.043), and days off from school or child care by 37% and parent time off from work by 33% (P value <0.001).

Intermittent high dose inhaled corticosteroids

In a Cochrane review in 2000,[28] the authors shown that

episodic high dose inhaled corticosteroid (1600-2250 microgram) reduced the requirement of oral corticosteroids during episodes of viral wheezing. The treatment was preferred by the childrens' parents over placebo. Episodic high dose corticosteroid can be an effective treatment of mild episodic viral wheeze of childhood.

In a recent study by Ducharme et al,[29] 129 children, aged 1-6, were randomly assigned to receive inhaled fluticasone propionate 750 microgram or placebo twice daily, beginning at the onset of an upper respiratory tract infection and continuing for a maximum of 10 days, over a period of six to 12 months. Preemptive treatment with high dose fluticasone as compared to placebo, significant reduced the use of rescue oral prednisolone from 18% to 8% (odd ratio 0.49, 95% CI 0.30-0.83). There were no significant differences between the two groups in basal cortisol level, bone mineral density, or adverse event. However, treatment with fluticasone was associated with a smaller gain in height and weight. It was concluded that in preschool-age children with moderate to severe virus induced wheezing, preemptive treatment with high dose fluticasone as compared to the placebo reduced the use of oral prednisolone, but it was associated with a smaller gain in height and weight. Further studies are required to clarify the long term side effects before the adoption of this preventive approach.

Intermittent use of oral leukotriene receptor antagonist vs intermittent high dose inhaled corticosteroids

In the Childhood Asthma Research and Education (CARE) Network trial,[30] the effectiveness of episodic use of inhaled corticosteroid and leukotriene receptor antagonist were compared in preschool children with intermittent wheezing. In this randomized, double-blinded placebo controlled trial, 238 children aged 12 to 59 months, with moderate to severe intermittent wheezing, received seven days of either budesonide inhalation suspension one mg twice daily, montelukast four mg daily or placebo in addition to albuterol at the first sign of respiratory tract infection, over a period of 12 months. The three treatment groups did not differ in the proportions of episode-free days with adjusted means of 76%, 73% and 74% for budesonide, montelukast and conventional therapy respectively (p=0.66). The three groups did not differ in oral corticosteroid use, health care use, quality of life or linear growth. However, indicators of the severity of acute illness were reduced with the use of budesonide and montelukast. They were associated with modest reductions in trouble breathing (38% and 37% respectively), and interference with activity scores (32% and 40% respectively), which were most evident in those with positive asthma predictive index. The clinical implication is that episodic use of budesonide or montelukast in preschool children with moderate to severe intermittent wheezing does not increase the proportion of episode-free days but does decrease symptom severity during acute respiratory tract infections.

Intermittent use of oral prednisolone

Oral corticosteroids are the bedrock of the management of acute asthma in older children and adults, but the evidence in preschool children is far less compelling. In a Cochrane Review in 2006 with two randomized clinical trial with a total of 303 participants, it did not find evidence that parent-initiated oral corticosteroid are associated with a benefit in terms of hospital admissions, unscheduled medical reviews, symptoms score, bronchodilator use, parent and patient impressions, physical assessment, or days lost from work or school.[31]

Panickar et al conducted a double-blinded placebo controlled trial to examine the effect of oral corticosteroid on hospitalized preschool children with episodic viral-induced wheezing. A total of 687 children (343 in prednisolone group and 344 in the placebo group), aged 10 months to six years, who remained symptomatic after 1 dose of albuterol, were randomized to receive oral prednisolone 10-20 mg (according to age) in this intention-to-treat analysis. The results shown that there was no significant difference in the duration of hospitalization between the placebo group and the prednisolone group (13.9 hours versus 11.0 hours; P value=0.18) or in the interval between hospital admission and sign-off for discharge by a physician (12.0 hours versus 10.1 hours; P value=0.16). In addition, there was no significant difference between the two study groups for symptoms score, albuterol use and adverse events.[32]

Another study by Csonka et al investigated the efficacy of oral prednisolone in patients with virally induced respiratory distress. This was a randomized double-blind placebo-controlled trial involving 230 children aged six to 36 months in the emergency department. Each patient received either oral prednisolone (two mg/kg/day, n=113) or placebo (n=117) for three days. The results showed that the hospitalization rates were similar between the two groups. For admitted children (n=123), the median length of stay was one day shorter in the

prednisolone group (2 vs 3 days, p value=0.060). The proportion of children requiring ≥3 days of hospitalization was 47.5% in the prednisolone group and 67.7% in the placebo group (p value=0.023). There was less need for additional asthma medication (18.0% vs 37.1%, p value=0.018) in the prednisolone group. The median duration of symptoms of respiratory distress was 1 day in the prednisolone group versus two days in the placebo group both among the hospitalized (p value <0.001) and non-hospitalized children (p value=0.006).

In summary, the current evidence did not support the routine use of oral prednisolone in non-hospitalized preschool children with viral induced wheeze. Prednisolone should be administered to preschool children only when they are severely ill in the hospital.[33]

Prophylactic oral leukotriene receptor antagonist
In the Prevention of Viral-Induced Asthma (PREVIA) study,[34] 549 children aged 2 to 5 years with a history of intermittent asthma symptoms, were randomized to receive oral montelukast four or five mg (depending on age) (n=278) or placebo (n=271) once per day for 12 months. Montelukast significantly reduced the rate of asthma exacerbations by 31.9% compared with placebo. The average rate of exacerbation episodes per patient was 1.60 and 2.30 episodes per year on montelukast and placebo groups (p value ≤0.001). Montelukast also delayed the median time to first exacerbation by approximately 2 months (p value=0.024), and reduced the rate of inhaled corticosteroid courses compared with placebo (p value=0.027). It was concluded that montelukast effectively reduce asthma exacerbations and increased time to exacerbations in two to five years old patients with intermittent asthma over 12 months period.

Prophylactic inhaled corticosteriod
Wilson et al studied the effect of four months' daily treatment with inhaled budesonide for 4 months on acute episodes of wheeze associated with viral infections in preschool children. It was a double-blinded parallel trial, including 41 children, aged 0.7-6.0 years, with predominantly episodic viral wheeze. The majority had a family history of asthma or atopic disease and their mothers smoked in 25%. Analysis of last 3 months showed no difference between budesonide or placebo in mean daily total symptom score (median values 0.6 and 0.63), episode number (mean value 2.6 and 2.4), or score/episode (mean value 30 and 31). Four months of treatment with inhaled budesonide had no effect on acute episodes of wheeze associated with viral infection in this group of children.[35]

Treatment of multiple trigger wheeze

Prophylactic inhaled corticosteroids
A systemic review of randomized double-blinded controlled trials of inhaled corticosteroids in preschool children with multiple trigger wheeze has shown significant improvements in important health outcomes, including symptoms, exacerbation rates, lung function and airway hyperresponsiveness.[36] Maintenance inhaled corticosteroids is the most effective measure for controlling frequent wheezing in preschool children, especially when accompanied by risk factors for asthma. The treatment effect, however, appeared smaller than that seen in school age children. For example, studies of inhaled corticosteroids in preschool with multiple trigger wheeze have reported a reduction in exacerbation by about 50%. Compared to placebo, children using fluticasone propionate 200 microgram per day exhibit a mean of five percent fewer days with symptoms.

In a recent systematic review with meta-analysis by Castro-Rodriguez et al[37] published in 2009, 3592 infants and children with recurrent wheezing or asthma for at least six months with a minimum of four weeks of inhaled corticosteroids versus placebo, were being analyzed. Patients who received inhaled corticosteroids had significantly less wheezing/asthma exacerbations than those on placebo (18.0% vs 32.1%); post-hoc subgroup analysis suggest that this effect was higher in those with a diagnosis of asthma than wheeze. In addition, children treated with inhaled corticosteroids had significantly fewer withdrawals caused by wheezing/ asthma excerbations, less albuterol use, and more clinical and functional improvement than those on placebo. It was concluded that infants and preschool children with recurrent wheezing or asthma had less wheezing/asthma exacerbations and improved their symptoms and lung function during treatment with inhaled corticosteroids.

Prophylactic oral leukotriene receptor antagonist[38]
The randomized, double-blinded placebo controlled trial by Knorr et al[38] in 2001 examined the efficacy of montelukast in children aged two to five years with persistent asthma. A total of the 689 patients were enrolled, and the age ranges were relatively evenly distributed with 21%, 24%, 30%, and 23% at two, three, four, and five years respectively. Up to 77% of the patients had the asthma symptoms first developed during the first three years of life. During the placebo baseline period, patients had asthma symptoms on 6.1 days/ week and used beta-agonist on 6.0 days/week. In over 12 weeks of treatment of patients aged two to

five years, montelukast administered as a four mg chewable tablet produced significant improvements compared with placebo in multiple parameters of asthma control including daytime asthma symptoms (cough, wheeze, trouble breathing, and activity limitation); overnight asthma symptoms (cough); the percentage of days with asthma symptoms; the percentage of days without asthma; the need for beta-agonist or oral corticosteroids; physician global evaluations; and peripheral blood eosinophils. It was concluded that the clinical benefit of montelukast was evident within one day of starting therapy. Improvements in asthma control were consistent across age, sex, race, and study center, and whether or not patients had a positive radioallergosorbent test. Montelukast demonstrated a consistent effect regardless of concomitant use of inhaled / nebulized corticosteroid or cromolyn therapy.

Prognosis

The most common parental concern is whether their children will outgrow the problem of recurrent wheezing. Many children who wheeze during the first two to three years of life have only a few episodes and do not wheeze after the age of three years. More than 80% of children who wheeze during the first year of life will stop wheezing by the age of three years; 60% of those wheezing in the second year and 30% to 40% of those wheezing in the third year also belong in this group. On the other hand, long term studies have shown that ~25% of children with persistent asthma had started to wheeze by the age of six months and 75% by the age of three years.

Management of children with preschool wheezing

Classification of recurrent wheeze into episodic viral wheeze and multiple trigger wheeze provides a practical framework for treatment. Inhaled corticosteroids had been used in the clinical problem of recurrent preschool wheezing. However, its main effect is symptomatic control rather than disease modification. The treatment of the condition would include the symptomatic treatment of bronchodilator, as well as the prophylactic use of inhaled corticosteroids, or leucotriene receptor antagonist or the combination. The choice of treatment will depend on the clinical phenotypes and other clinical factors (Table 1 and Figure 3).

Table 1. Consensus in management of recurrent wheezing in preschool children

- For clinical purpose, wheeze should be described in terms of its clinical pattern and classified as episodic viral or multiple-trigger wheeze.
- Neither continuous nor intermittent inhaled corticosteroids modified the course of preschool wheezing, even in infants who were in a high risk group for disease progression.
- Symptomatic treatment of viral induced wheeze / acute wheezing episodes
  a. Inhaled short acting beta-2 agonist on as needed basis should be used for the symptomatic treatment of acute wheezing in preschool children.
  b. Addition of Ipratropium bromide to short acting beta-2 agonist may be considered in patients with severe wheeze.
  c. Prednisolone should be administered to preschool children only when they are severely ill in the hospital. Parent initiated oral prednisolone in non-hospitalized preschool children with viral induced wheeze is not advisable.
  d. Montelukast four mg once daily for seven -20 days should probably be given for the treatment of episodic viral-induced wheeze
  e. Although high dose inhaled steroids therapy appears to have a small beneficial effect in the treatment of acute wheezing in preschool children, this treatment is not recommended until long term side effects are clarified.
- Prophylactic treatment of viral induced wheeze
  a. Montelukast four mg once daily should probably be given for the treatment of episodic (viral) wheeze
  b. A trial of maintenance inhaled corticosteroids may be considered in preschool children with episodic viral wheeze, in particular when episodes occur frequently or if the family history of asthma is positive.
- Prophylactic treatment of multiple trigger wheeze
  a. Inhaled steroids at a daily dose of up to 400 mg/day beclometasone equivalent should be given for the treatment of preschool children with multiple-trigger wheeze.
  b. When the response to this treatment is poor, patients should not be treated with higher doses but should probably be referred to a specialist for further evaluation and investigations.
  c. If response to inhaled steroids is favorable, treatment should probably be discontinued after several weeks or months, in order to judge whether symptoms have resolved or whether ongoing treatment is needed.
  d. Growth especially the height of the child should be measured in preschool children using inhaled steroids.
  e. A trial of montelukast may be considered in preschool children with multiple-trigger wheeze. Reassessment should be done after several weeks or months.

Conclusions

Recurrent wheezing in preschool children is a common clinical problem. Classification of recurrent wheeze into episodic viral wheeze and multiple trigger wheeze enables us to manage the condition with the treatment of inhaled corticosteroids and/or leucotriene receptor antagonist or the combination.

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