Myth: Cool mist is an effective therapy in the management of croup

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Introduction

Croup is the most common infectious cause of acute airway obstruction in children between 1 and 6 years of age, accounting for 90% of cases of stridor.[1] The majority of cases of croup are caused by parainfluenza and occur during the late fall and winter. Mist has been a mainstay for croup since the 19th century and, even today, many emergency departments (EDs) routinely begin cool mist therapy for patients with croup. Further therapy of croup typically includes nebulized racemic epinephrine and corticosteroids.

Theorized benefits of mist therapy

The theorizetical benefits of cool mist can be categorized into 3 main mechanisms. The first is that cool mist soothes inflamed airway mucosa, decreasing airway inflammation. Second, cool mist is believed to moisten secretions and reduce their viscosity. Less viscous secretions are more easily cleared from the airway, eventually decreasing airway obstruction. Third, animal data has demonstrated that microaerosol inhalation may activate airway mechanoreceptors that modify the pattern of breathing, ultimately improving respiratory flow rates in partially obstructed upper airways.[2]

Evidence refuting mist as an effective therapy

Aerosolized water particles will not reach the subglottic region if they are more than 5 to 10 μm in diameter.[3] Showers and humidifiers generate water particles in the range of 10 μm; these are too large to reach areas of the respiratory tract beyond the oropharynx.[3–5] As a result, the mist from a shower or home humidifier is unlikely to have any effect on subglottic mucosal inflammation or secretions. In contrast, mist particles from a nebulizer are smaller than 5 μm and do reach subglottic tissues.[4–6]

In 1978, Lenney and Milner first attempted to objectively measure the response to nebulized water in croup by evaluating both mist and a nebulized alpha-adrenergic agent. Total respiratory resistance was measured in 5 children with viral croup before and after sterile nebulized water was administered. The largest decrease in respiratory resistance was 7%, and the greatest rise was 24%, but no children experienced a clinical or objective improvement after the administration of nebulized water.[7]

Bourchier and coworkers randomized 16 children with viral croup to either a high humidity environment or room air. Over a 12-hour observation period, both groups had similar changes in heart rate, respiratory rate, transcutaneous carbon dioxide levels, transcutaneous oxygen saturation and clinical rating. The authors were unable to demonstrate a therapeutic benefit of humidified air and concluded that its use for croup therapy requires reappraisal.[8]

In the largest study to date, Neto and colleagues performed a randomized blinded trial to assess the effect of mist therapy in 3- to 6-year-old children presenting to the ED with moderate croup. Seventy-one children were enrolled; 35 received mist therapy, and 36 did not. Outcomes were measured as changes from baseline at 30, 60, 90 and 120 minutes. The authors failed to demonstrate significant

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differences in croup score, oxygen saturation, respiratory rate or pulse rate, and concluded that cool mist is not an effective therapy for children with moderate croup.[4]

Overall, trials investigating the use of cool mist in moderate croup have not documented a change in croup scores, vital signs, global assessment, or ED length of stay.[4,8] Although mist has not been proven to be beneficial in moderate croup, it is unknown whether it is beneficial in cases of mild croup.

The case against mist therapy

The use of mist has 3 potential negative effects, although these have not been clearly demonstrated in clinical studies. First, the sensation of mist being blown on their face may make some children anxious, and this anxiety may lead to tachypnea, which aggravates airway obstruction. Second, humidified air may increase airway edema and accumulation of secretions, as was shown in a study of 12 dogs that were sedated and had moist air passed over their vocal cords.[9] Third, mist equipment (predominantly home humidifiers) have been contaminated with both fungi and pathogenic bacteria, particularly *Pseudomas aeruginosa*.[10]

Conclusions

Since the 19th century, mist has used in the management of croup, with the belief that it soothes inflamed airways, thins secretions and improves respiratory flow rates. However, the particles generated by showers and home humidifiers are too large to reach the affected subglottic region, and clinical trials have not shown that nebulized water is an effective therapy for croup. Moreover, there is limited evidence suggesting that it may be harmful. Time, energy and money spent on humidification mechanisms may be better spent on proven therapies such as corticosteroids and nebulized epinephrine.

Competing interests: None declared.

Key words: croup; cool mist

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