

Bubble CPAP in Acute Bronchiolitis

We read with interest the study by Lal, *et al.* [1] on the utility of nasal bubble continuous positive airway pressure (CPAP) in children with moderate to severe bronchiolitis. The authors noted a significant reduction in respiratory rate (cut-offs defined *a priori*) in the CPAP limb of the study. CPAP helps in bronchiolitis by splinting airways, thereby reducing airway collapse and atelectasis and improving oxygenation. Here, we comment on a few points in this study and present findings of two other original studies from resource-limited settings [2,3] not cited in this study.

Using only the first hour of therapy to judge improvement may be inadequate as pathology in bronchiolitis is likely to continue for at least 24–48 hours, necessitating longer support. Initial improvement in respiratory rate could have been related to non-respiratory factors like improved hydration, fever control and decreased anxiety. Sustained improvement in respiratory parameters, assessing need for additional/alternative respiratory support in either treatment arm, post-1 hour of therapy would have helped substantiate the initial improvement as respiratory. In a setting where bubble CPAP maybe the only means of non-invasive support available, it is important to know if children in standard care arm were offered a trial of CPAP in case of non-improvement?

We bring your attention to a prospective study from our center [2], where indigenous nasal bubble CPAP in children with hypoxemic clinical pneumonia (pneumonia $n=240$ and bronchiolitis $n=90$) aged 1 month to 12 years, was associated with good response and negligible failure rate and complications. Of the 330 enrolled children, 204 were initiated on nasal prongs oxygen, 110 with increased work of breathing and/or SpO₂ <92% on bubble CPAP, and 16 were intubated at admission. The Respiratory Distress Assessment Instrument (RDAI) tool objectively assessed worsening respiratory distress or improvement. 53 children on nasal prongs were switched to bubble CPAP for worsening respiratory distress. Only 3 children from the bubble CPAP group required intubation.

Chisti, *et al.* [3], in their study in Bangladesh,

enrolled children <5 years of age with pneumonia/bronchiolitis to receive either bubble CPAP, low flow oxygen or high flow oxygen. They found that treatment failure and mortality were lower in the bubble CPAP arm as compared to the low flow oxygen therapy group; the trial was terminated early due to mortality difference (higher in low flow oxygen group).

In a resource limited set-up, where cost is a major constraint, bubble CPAP can serve as a simple low-cost method of non-invasive respiratory support, provided some limitations with respect to higher FiO₂ provided, leak from the circuit and complications like gastric distention, and rarely air-leaks are kept in mind and monitored for carefully.

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Nasal CPAP in Bronchiolitis

We read with interest the article on use of nasal continuous positive airway pressure (CPAP) in bronchiolitis by Lal, *et al.* [1]. We have few comments related to this article:

First, the authors have considered respiratory rate at one hour of treatment as primary outcome. As we know that the signs and symptoms of bronchiolitis may vary even from minute to minute, a change in respiratory rate at one hour may not have any clinical importance [2]. Moreover, it has been reported that there is inter-observer variability in assessment of respiratory rate in infants. Ideally quality control measures like video recording of respiratory rate, which is feasible, should be taken to avoid subjective bias of primary outcome [3].

Second, outcome as well as complications of CPAP will also depend on flow rate and peak end expiratory pressure (PEEP). Authors have not mentioned about flow rate and PEEP in their study [4].

Third, authors have used Silverman-Andersen score – that is primarily used to assess respiratory distress in premature baby – and Modified Pediatric Society of New Zealand Severity Score. These scores have not been validated as an outcome measure in infant with bronchiolitis [5].

Finally, the information about weight, length and Z-scores are missing, which are important baseline characteristics. In table II, the value of standard deviation are greater than the mean value. It will be better if these data would have been presented as median and interquartile range.

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Nasal Continuous Positive Airway Pressure for Bronchiolitis

In the January 2018 issue of *Indian Pediatrics*, Lal, *et al.* [1] reported that nasal continuous positive airway pressure (nCPAP) helped to reduce respiratory distress significantly compared to standard care in infants. We have certain queries and comments:

Bronchiolitis is a dynamic disease which requires frequent monitoring and management accordingly [2]. So, why did the author choose to see the effect of CPAP on

children with bronchiolitis for initial first hour only? Improvement in first hour of admission does not prove the long-term efficacy of the modality. As bronchiolitis has become a major cause of morbidity and bed occupancy in our setting, it would have been very informative had they reported on the effect of CPAP on treatment outcomes like requirement of mechanical ventilation and duration of hospital stay.

Authors have used two scoring systems, Silverman-Anderson Score and Modified Pediatric Society of New Zealand Severity Score, for assessing their secondary outcome. Silverman-Anderson scoring system is mainly used for monitoring respiratory distress in preterm neonates [3]. Though they have used an intention-to-treat analysis, changes in respiratory rate have been compared only in those children who completed the study. The pressures and the type of interface used for the CPAP has not been mentioned. All of these above-mentioned factors make the generalizability of the study doubtful in our set up.

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AUTHORS' REPLY

Using CPAP for Bronchiolitis

The main point of criticism of our study [1] by all these readers is that we assessed only for benefits over the first hour of admission. This is a valid point. The reason for such protocol was the ethical issue. Theoretically, it was not logical to use CPAP (that increases dead space [2]) to treat a condition like bronchiolitis, which is characterized by air trapping [3]. This is why we decided to study this modality for the first hour, while we closely monitored the child, ready to switch to more conventional modalities if the baby's distress increased. Most babies did well on CPAP, and this was continued after the 1-hour study period, but the protocol was to study distress (improvement or