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Review article

Effects of the use of respiratory physiotherapy in children admitted with acute viral bronchiolitis

G. Rodrigues Gomes [a], M.V. Fagundes Donadio [b,*]

[a] Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Porto Alegre, Brazil
[b] Centro Infant, Institute of Biomedical Research, Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Porto Alegre, Brazil

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ABSTRACT

Objective: To evaluate the effects of the use of respiratory physiotherapy in children admitted with acute viral bronchiolitis (AVB).
Methods: A literature review was done searching the Pubmed, LILACS, PEDro, and Scielo databases. The following key words were used: bronchiolitis, physiotherapy, techniques, physical therapy, and chest physiotherapy. Both controlled and uncontrolled clinical trials, without limits as to date, were selected.
Results: Fifteen articles were included and the use of different techniques of respiratory physiotherapy showed positive results in eight studies. Most (11) were controlled clinical trials, and only two had a double-blind design. Of the 14 studies with a control group, in six this group was submitted to nasopharyngeal aspiration. The most widely used techniques were manual vibration and postural drainage (eight studies), and then tapping/percussion (seven studied). The maneuvers considered as current, e.g., prolonged slow expiration, expiratory flow acceleration, and rhinopharyngeal retrograde clearance, were used in four, four, and two studies, respectively.
Conclusions: The use of respiratory physiotherapy in children with AVB remains controversial. The heterogeneity of techniques evaluated in the studies limits the interpretation of efficacy, although its use was considered safe. Recent findings indicating a reduction in the length of the hospital stay remain to be confirmed.

1. Introduction

Acute viral bronchiolitis (AVB) is an acute injury to the respiratory bronchioles associated with a viral infection, with a peak incidence at the age of 2–6 months [1,2]. It results in obstruction of the small-caliber airways, due to infection by seasonal viruses [3]. Although it is usually a self-limiting disease, it produces significant morbidity in infants less than 6 months of age and patients with chronic diseases, as a result of the ventilation-perfusion mismatch, characterized by increased respiratory work [4,5].

The basic principles for the care of children during the hospital stay are oxygen support therapy, fluid administration to prevent dehydration, and guidance to parents [5,6]. In some cases it may be necessary to clear the airway by removing secretions [7]. Among the most commonly used respiratory physiotherapy techniques are those described as conventional physiotherapy, which consists of a combination of tapping, percussion, postural drainage, and assisted cough [8], as well as newer techniques such as prolonged slow expiration (PSE) and rhinopharyngeal retrograde clearance (RRC) [9,10].

Although more recent recommendations suggest that the use of respiratory physiotherapy techniques in the management of AVB should be indicated according to the severity of the disease [7], evaluated through clinical scores [11], the role of these techniques is still controversial and its recommendation challenging. The last systematic review [12] maintained the conclusion that the use of respiratory physiotherapy does not reduce the severity of the disease and should therefore not be used as standard clinical practice for hospitalized patients with severe bronchiolitis. Several aspects should then be carefully examined and revised, including the relation of severity with indication, the main outcomes to be

* Corresponding author. Centro Infant, Instituto de Pesquisas Biomédicas (IPB), avenue Ipiranga, 6690, 2° andar, CEP 90610-000, Porto Alegre, Rio Grande do Sul, Brasil.
E-mail address: M.V.Fagundes Donadio[b,*]mdonadio@pucrs.br (M.V. Fagundes Donadio).

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measured, and the type of respiratory technique to be applied. Older studies using conventional techniques did not demonstrate benefits with their use, based on the lack of statistical significance in criteria such as clinical scores, length of hospital stay, or days of oxygen therapy use [13–15]. On the other hand, more recent studies including the use of new techniques of respiratory physiotherapy have demonstrated positive effects in the removal of secretion, reduction of clinical scores, and respiratory discomfort with short-term improvement of respiratory signs and symptoms [10,16,17], as well as length of hospital stay [18].

Therefore, considering the controversies regarding the use of respiratory physiotherapy in children with AVB, the new evidence on more modern techniques and the recent recommendation of basing physiotherapeutic management on disease severity, a comprehensive review on the subject is warranted. Therefore, the objective of this study was to evaluate, through a review of the literature, the effects of the use of respiratory physiotherapy in hospitalized children with AVB.

2. Methods

This is an integrative literature review study. Clinical trials evaluating the effects of respiratory physiotherapy in children admitted with a diagnosis of AVB were included. Articles including patients with chronic conditions, review studies, case studies, experimental models, abstracts, response letters, editorials, and duplicate publications, as well as those that did not meet inclusion criteria or that did not address the subject matter were excluded after the analysis of the abstract or full text.

The Medline/PubMed, Scielo, LILACS, and PEDro databases were searched, using the following combination of Keywords: "bronchiolitis AND physiotherapy", "bronchiolitis AND physiotherapy AND techniques", "bronchiolitis AND physical therapy", "bronchiolitis AND physical therapy AND techniques", "bronchiolitis AND chest physiotherapy" and "bronchiolitis AND chest physiotherapy AND techniques". Also; a manual search was conducted in the bibliographic references of selected articles; as well as in systematic reviews; in order to search for additional publications that were pertinent to the study. No relevant articles were found through this search. No filters were used for language selection.

The searches were conducted from October to December 2016 by two independent authors. After reading the title, followed by the abstract, only studies reported as clinical trials, whether or not they were controlled, were included. No limit was used as to the date of publication or for article selection. Articles that met the inclusion criteria were read in full and the following data were extracted: title, author, year of publication, study design, sample size, respiratory physiotherapy technique, outcomes, and main results. Data collected were tabulated in a Microsoft Excel spreadsheet for analysis.

3. Summary of findings

A total of 504 articles were searched. After careful reading of the title and the abstract, 489 were excluded and a total of 15 articles that met the inclusion criteria were selected. Fig. 1 shows the complete search flow of the study.

3.1. Study designs and sample size

As shown in Table 1, of the total of 15 articles, the majority (13 articles) were randomized clinical trials [9,10,13–16,18–24], of which only three used a double-blind design [18,20,21]. In 14 studies, a control group was included, but in only six studies was the control group submitted to nasopharyngeal aspiration/nasal suction [9,10,14,15,19,21]. Also, in six studies, the control group was not submitted to any airway clearance intervention [13,16,18,20,22,24] and in one study healthy children were included [25]. Regarding the sample size, eight articles included a sample with between 19 and 50 patients [9,14–17,19,23,25], four between 81 and 100 [10,13,18,24] and three studied a sample between 103 and 496 patients [20–22]. Although an adequate study design to test an intervention (randomized controlled clinical trial) was used in 14 out of 15 studies, the sample size could be considered small, which was a limitation in most of the studies included.

3.2. Respiratory physiotherapy techniques

The most widely used techniques in the articles selected for this review were manual vibration, which appeared in eight articles [9,14,15,17,19,20,24,25] and postural drainage in another eight studies [9,13–15,19,23–25], followed by tapping/percussion in seven studies [13–15,17,19,23,25]. The combination of respiratory physiotherapy techniques and provoked cough appeared in four studies [16,20,22,24] and combined with nasopharyngeal aspiration/nasal suction in eight studies [13–15,17,19,21,23,25]. On the other hand, the maneuvers considered as more recent in pediatric respiratory physiotherapy, such as PSE, acceleration of expiratory flow (AEF) and RRC, were used in four [9,16,20,22], four [17,22–24], and two studies [9,10], respectively. The summary of these findings is presented in Table 1.

The use of techniques considered as modern, such as PSE, AEF, and RRC, presented favorable results in the outcomes evaluated in four studies. The PSE is derived from a variation of the total slow expiration in infralateral decubitus with the open glottis, and may be associated with provoked cough and/or preceded by treatment with bronchodilators [8]. It is considered to be well tolerated by infants with muscle fatigue and bronchial reactivity without adverse effects such as alveolar collapse and increased transmural pressure. However, the results of this review point to divergent findings regarding this technique, since the studies by Postiaux et al. [16] and Gomes et al. [9] showed improvements in signs, symptoms, and clinical scores, and the study by Rochat et al. [22] showed no benefits.

It is known that pediatric respiratory physiotherapy developed as an adaptation of the techniques used in adult patients. With the emergence of new studies and discoveries, new maneuvers have emerged to fit the anatomical and physiological differences of pediatric patients, especially young infants [5]. On the other hand, some techniques have already been reported as potentially harmful or unsafe for infants, such as tapping and manual vibration [26]. The mechanical action of these techniques may lead to hypoxemia, an increase in intrathoracic pressure, and inefficiency in the clearance of bronchial secretions [26–28], which could explain the lack of efficacy of respiratory physiotherapy using such techniques in infants with AVB. There are also reports of the use of postural drainage, which has been shown to be unfavorable for increasing intracranial pressure, esophageal reflux, and risk of bronchoaspiration [29,30]. Of the articles included reporting the use of postural drainage, only two described the technique, making it difficult to interpret and differentiate the use of positioning during respiratory physiotherapy and the actual use of postural drainage. In the literature, postural drainage is commonly seen and used in adults with excessive production of secretion and with difficulty in sputum clearance, mainly and historically in patients with cystic fibrosis, demanding time in positions of angulated decubitus and knowledge of the anatomy of the airways so that previously mobilized secretion present in the distal bronchi may travel to the central region and/or near the trachea by the effect of gravity on secretions [31]. On the other hand, positioning during respiratory

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