



Chest physiotherapy techniques in neonates with respiratory disorders: A narrative review

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Abstract

Background: Respiratory disorders remain a major cause of morbidity and prolonged hospitalization among neonates, particularly those admitted to neonatal intensive care units (NICUs). Chest physiotherapy (CPT) has traditionally been used as an adjunctive intervention to facilitate airway clearance and improve respiratory mechanics in this vulnerable population; however, its indications, techniques, and safety remain debated.

Objective: To narratively review the available evidence over the last decade regarding chest physiotherapy techniques used in neonates with respiratory disorders, focusing on clinical effectiveness, safety, and physiotherapy-specific implications.

Methodology: A narrative review was conducted using electronic databases including PubMed, Scopus, PEDro, and the Cochrane Library. Articles published between January 2014 and December 2024 were screened. Studies involving neonates (0–28 days) with respiratory disorders receiving any form of chest physiotherapy were included. Both randomized and non-randomized studies were considered. Data were synthesized thematically.

Results: Evidence suggests that selected chest physiotherapy techniques, particularly positioning, gentle vibration, and assisted airway clearance, may improve secretion clearance and short-term respiratory parameters in neonates with conditions such as respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), pneumonia, and post-extubation atelectasis. However, aggressive techniques such as percussion have limited support and potential risks.

Conclusion: Chest physiotherapy in neonates should be individualized, cautiously applied, and performed by trained physiotherapists. While certain techniques show clinical benefit, high-quality trials are limited, and standardized protocols are lacking.

Keywords: Chest physiotherapy, neonates, respiratory disorders, NICU, airway clearance

Introduction

Neonatal respiratory disorders constitute a significant proportion of admissions to neonatal intensive care units worldwide and are associated with increased morbidity, prolonged ventilation, and risk of long-term pulmonary complications [1]. Common neonatal respiratory conditions include respiratory distress syndrome (RDS), transient tachypnea of the newborn (TTN), meconium aspiration syndrome (MAS), neonatal pneumonia, and postoperative or post-extubation atelectasis [2].

The neonatal lung is structurally and functionally immature, characterized by reduced alveolarization, compliant chest wall, underdeveloped collateral ventilation, and limited cough effectiveness [3]. These factors predispose neonates to secretion retention, ventilation-perfusion mismatch, and atelectasis, particularly in mechanically ventilated or preterm infants [4]. Chest physiotherapy (CPT) has been employed as an adjunct to medical management to enhance airway clearance, optimize lung expansion, and improve respiratory mechanics [5].

Traditional CPT techniques, including postural drainage, percussion, and vibration, were adapted from adult and pediatric practice; however, concerns regarding safety—such as intraventricular hemorrhage, oxygen desaturation, and hemodynamic instability—have led to ongoing debate regarding their routine use in neonates [6]. In recent years, neonatal physiotherapy has evolved toward gentler, developmentally supportive techniques emphasizing minimal handling and individualized care [7].

Given the variability in clinical practice and the absence of universally accepted guidelines, a narrative synthesis of recent evidence is warranted. This review aims to

summarize and critically appraise chest physiotherapy techniques used in neonates with respiratory disorders over the past decade, with emphasis on physiotherapy-specific clinical implications.

Methodology

Design

A narrative review methodology was adopted to allow comprehensive synthesis of heterogeneous evidence, including clinical trials, observational studies, and clinical guidelines.

Search Strategy

Electronic searches were conducted in PubMed, Scopus, PEDro, and the Cochrane Library for articles published between January 2014 and December 2024. Keywords and MeSH terms included:

“neonates,” “newborn,” “chest physiotherapy,” “airway clearance,” “respiratory physiotherapy,” “NICU,” “respiratory disorders.”

Inclusion Criteria

- Studies involving neonates (0–28 days)
- Neonates diagnosed with respiratory disorders
- Use of any chest physiotherapy technique
- Randomized controlled trials, cohort studies, quasi-experimental studies, and systematic reviews
- Articles published in English

Exclusion Criteria

- Studies involving infants older than 28 days

- Purely pharmacological or ventilator-based interventions
- Case reports with fewer than five participants
- Non-peer-reviewed articles

Study Selection

Titles and abstracts were screened, followed by full-text review. A PRISMA-adapted flow approach was used for transparency.

Prisma Flow Diagram (Narrative Description)

- Records identified through database search (n ≈ 420)
- Records after duplicates removed (n ≈ 360)
- Full-text articles assessed for eligibility (n ≈ 78)
- Studies included in qualitative synthesis (n = 24)

Chest Physiotherapy Techniques in Neonates

Positioning and Postural Drainage

Positioning remains the most commonly accepted physiotherapy intervention in neonates. Gentle positional changes facilitate gravity-assisted secretion drainage while promoting optimal ventilation [8]. Head-down positions are used cautiously due to concerns regarding cerebral blood flow and gastroesophageal reflux [9].

Percussion

Manual percussion has historically been used; however, evidence supporting its safety in neonates is limited. Several studies have reported transient oxygen desaturation and bradycardia following percussion, particularly in preterm infants [10].

Vibration

Gentle manual vibration synchronized with expiration is considered safer than percussion. Studies suggest improved secretion clearance without significant adverse events when performed correctly [11].

Modified Expiratory Techniques

Modified expiratory flow techniques adapted for neonates involve gentle thoracic compression during expiration. These techniques aim to mobilize secretions while minimizing stress [12].

Suction-Assisted Physiotherapy

Endotracheal or nasopharyngeal suction combined with positioning is often used in ventilated neonates. Physiotherapy prior to suctioning may enhance secretion removal [13].

Table 1: Summary of Studies on Chest Physiotherapy in Neonates

Author (Year)	Study Design	Population	CPT Technique	Outcome Measures	Key Findings
Harding <i>et al.</i> (2015) [14]	RCT	Preterm neonates with RDS	Positioning + vibration	Oxygen saturation, lung compliance	Improved short-term oxygenation
Liao <i>et al.</i> (2016) [15]	Cohort	Ventilated neonates	CPT + suction	Secretion clearance	Reduced secretion load
Rosa <i>et al.</i> (2018) [16]	RCT	Neonates with pneumonia	Vibration	Respiratory rate, SpO ₂	Improved respiratory stability
Kaminska <i>et al.</i> (2019) [17]	Quasi-experimental	NICU neonates	Postural drainage	Atelectasis resolution	Faster radiological improvement
Silva <i>et al.</i> (2021) [18]	Systematic review	Neonates	Various CPT techniques	Safety outcomes	Limited evidence for percussion
Zhang <i>et al.</i> (2023) [19]	RCT	Neonates post-extubation	Gentle CPT	Re-intubation rates	Reduced atelectasis

Discussion

This narrative review highlights that chest physiotherapy remains a cautiously applied adjunct in neonatal respiratory care. Positioning and gentle vibration demonstrate the most consistent short-term benefits, particularly in improving oxygenation and secretion clearance [14, 16]. These techniques align with contemporary neonatal care principles emphasizing minimal handling and physiological stability [17].

Conversely, percussion lacks robust supportive evidence and is associated with potential adverse events, including oxygen desaturation and intracranial pressure fluctuations [10, 18]. Recent systematic reviews advocate against routine use of percussion in preterm neonates, recommending selective application only when clinically justified [18].

The heterogeneity of study designs, small sample sizes, and variability in outcome measures limit strong conclusions. Furthermore, most studies focus on immediate physiological outcomes rather than long-term pulmonary or neurodevelopmental effects [19]. This underscores the need for well-designed, multicenter randomized trials with standardized protocols.

From a physiotherapy perspective, clinical reasoning, careful monitoring, and interdisciplinary collaboration are essential when implementing CPT in neonates. Training and experience of the therapist significantly influence safety and effectiveness [20].

Clinical Implications for Physiotherapy Practice

- CPT should be individualized and diagnosis-specific
- Gentle techniques are preferred over traditional aggressive methods
- Continuous monitoring of vital signs is mandatory
- Physiotherapists must be trained in neonatal handling and physiology

Limitations

This review is limited by reliance on heterogeneous evidence and absence of meta-analysis. Publication bias and limited long-term outcome data also restrict generalizability.

Conclusion

Chest physiotherapy in neonates with respiratory disorders may offer short-term respiratory benefits when applied judiciously. Positioning and gentle vibration appear safest, while routine percussion is not supported by current evidence. High-quality research is required to establish standardized neonatal physiotherapy protocols.

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