

Infant with Bronchiolitis and Chest Physical Therapy: A Case Report

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Abstract: Bronchiolitis is a lower respiratory tract infection present with inflammation of bronchioles. Bronchiolitis is generally managed successfully with medical interventions in infants. The chest physical therapy (CPT) has been used in the management of many cardio-respiratory conditions with or without medical interventions. The currently available literatures on the effectiveness of CPT in bronchiolitis are inconclusive and uncertain. So our effort was to study and report the effect of CPT in the form of conventional interventions along with prolong slow expiration (PSE) technique on respiratory rate, heart rate and SpO₂ and to evaluate the safety of PSE technique in infant with moderate bronchiolitis. After three sessions of conventional CPT and PSE along with medical interventions, we found improvement of clinical symptoms of moderate bronchiolitis in infant. The PSE technique is not only safe to use in infant with moderate bronchiolitis along with medical interventions, but may also shorten the length of hospital stay. Further studies can be conducted to confirm its effectiveness in larger population.

Keywords: Bronchiolitis, Chest Physical Therapy, PSE in infants

INTRODUCTION

Bronchiolitis is a lower respiratory tract infection present with inflammation of bronchioles [1]. According to the World Health Organization bulletin, an estimated 150 million new cases of bronchiolitis occur annually [2]. Worldwide, 95% of all cases occur in developing countries [3]. Among them 80% cases [4] occurs due to the infection of respiratory syncytial virus (RSV) which results in tachypnea, cough, mild fever and runny nose as the most common symptoms of this disease. Crackles and wheeze are the most common findings on auscultation. Increased respiratory rate, lower oxygen saturation, rapid pulse rate are main symptoms of this condition. Bronchiolitis is well managed medically which may require hospitalization for around five days with or without CPT interventions in all age groups. CPT has been proven beneficial [1,5] in the management of many cardio-respiratory conditions with or without medical interventions. The prolonged slow expiration technique is often used to clear lung secretions and reduce respiratory obstruction in infants.

The available literature supporting CPT in the management of bronchiolitis in developing countries are limited [6]. So, our main effort was to study the effect of CPT in the form of PSE technique on respiratory rate, heart rate and SpO₂ and its safety in infant with moderate bronchiolitis. We hypothesized that the PSE could be an effective and a safe technique along with medical interventions in restoring respiratory

rate, heart rate and SpO₂ in infant with moderate bronchiolitis.

CASE REPORT

A 10 months old Gujarati male infant weighing 9.85 kilogram who belongs to lower socio-economic status [7] complains of cough, runny nose, breathlessness, cold and mild fever since three days. He was born full term (35 weeks) weighing 3.5 kilogram through vaginal delivery without any complications. The parents denied the history of any medical complication at the time of delivery. During pregnancy his mother reported as being anaemic (Haemoglobin 8.5 g/dl) and had taken necessary supplements. His parents were consanguineous and the mother was 18 year old at the time of child birth. They live in a crowded area where the infant's father and grandfather were smokers (14-15 times/day) since many years. At 2 months of age the infant had cough, fever, runny nose and breathlessness and admitted to hospital as reported by the parents. The condition was then managed only with medical interventions including antibiotics, bronchodilator, nebulization and oxygen therapy which took 5 days to recover. No known CPT was reported to be given.

The infant was reported again with the same problems (cough, fever runny nose and breathlessness) since three days and consulted to a physician. After examining the sign and symptoms, the medications were started but no investigations were performed at that time. But the symptoms got worsened despite of three days of management for which the parents

brought him to our hospital and consulted the Paediatrician. After examination of signs and symptoms the Paediatrician advised for chest x-ray and complete blood count (CBC) report. The infant was diagnosed as moderate bronchiolitis as per the findings of the chest x-ray (Figure 1) and CBC report[1,5] and immediately admitted to paediatric ward. The antibiotic (Cefotaxime 500 IV BD once/day), bronchodilator (asthalin 1mgthrice/day) and cough syrup (Tus-Q-D TDS) was started and also referred for chest physical therapy on the same day. After two days of medication the infant started breathing through mouth due to accumulation of secretion (nasal blockage) and exacerbation of cough which was aggravated during crying and feeding so nebulization was given every 2 hourly followed by suctioning. Palivizumab (15mg/kg) was also given as a prophylaxis for bronchiolitis [6] and advised for exclusive breast feeding. The father and grandfather were given counselling for cessation of smoking too.

The initial physical therapy assessment revealed unproductive dry cough (10-14 times per day)

which was aggravated during crying and breast feeding and relieved by rest and medications. The amount of sputum production was one egg cup of white colour and mucoid in consistency. On observation, there were no sign of cyanosis, clubbing, peripheral oedema etc. Mild sternal retraction was present but use accessory muscles for respiration was not noticed. The shape of the chest appeared normal and movement was symmetrical. While auscultation of the chest, fine inspiratory crackles and wheeze during expiration in middle and both the lower lobes were noted. All other routine paediatric physical assessments like nail-blech test, heart sounds, new Ballard score and primitive reflexes were examined and found have normal findings.

The symptoms cough, breathlessness, decreased oxygen saturation and increased work of breathing as a result of moderate bronchiolitis was the initial working hypothesis for the CPT. Heart rate, respiratory rate and level of oxygen saturation was used as an outcome measure to record the changes.



Figure 1: Chest X-Ray PA view of 10 month old infant with moderate bronchiolitis

The CPT interventions were started from the first day of hospitalization for total 5 sessions (2 session/day) in 3 days. Each of the CPT session lasted approximately for 20 to 30 minutes. The CPT consisted of conventional interventions (postural drainage, percussion, and vibration) and PSE techniques emphasizing to remove secretions from lung, to reduce work of breathing, to improve level of oxygen saturation and to prevent further complications of condition. Postural drainage (PD) methods were applied to facilitate dislodgement of secretions up to upper respiratory tract from the right middle lobe and the lateral segments of bilateral lower lobes. Percussion technique was used for loosening of bronchial secretions by applying continuously and rhythmically with 3-fingered 'tenting' position over the affected site for 2-3 minutes. The chest wall vibration technique was

used for dislodging already loosen secretions. Vibration was applied rapidly in a manner of fine movement with 2 or 3 fingers over the chest wall during the exhalation phase for 4-5 minutes. The PSE technique was used in an attempt to prolong expiratory phase and thereby promoting secretion clearance and reduce air trapping. After placing the left hand hypothenar region below the suprasternal notch and right hand below the umbilical scar identified the expiratory phase by observing the thoracic movement. Then applied compression force with both the hands at the end of expiratory phase. The left hand moved in the direction of cranial-caudal while the right hand moved in the direction of caudal-cranial and the technique was repeated three times providing 30 seconds rest interval between each sequence [8].

Table 1: Data of Pre and Post Vitals

	Baseline	After three days
Temperature	98 ⁰ F	97 ⁰ F
Heart rate	148/min	128/min
Respiratory Rate	70/min	30/min
SpO ₂	87%	95%
Wheeze	Present	Present
Crackles	Present (Middle and B/L lower lobe)	Decreased (Middle and B/Lower lobe)

DISCUSSION

Bronchiolitis is generally managed alone medically emphasizing on symptomatic treatment using bronchodilator and cough syrups. But the available literature suggested no improvement in clinical features of bronchiolitis with the use of bronchodilator [9]. This infant with bronchiolitis was managed medically along with conventional CPT and prolonged slow expiration technique. After combined management for three days, there were improvement in heart rate, respiratory rate, SpO₂ and other sign and symptoms (Table 1) and was discharged two days earlier from the expected duration of hospital stay (five days) in most of the condition. The PSE was also found to be safe to use in infant and contribute to restore the clinical condition.

A previous study investigating the efficacy of conventional CPT in bronchiolitis has proven to be ineffective [10] which is contrary to what we observed in this case. This may be due to the addition of PSE technique which lead to normalization of heart rate, respiratory rate, and improve SpO₂ and other signs and symptoms in this case which is also supported by the earlier studies [11]. The PSE is physiological based technique which activates Hearing-Breuer reflex by prolong sighs and time, helping the secretions to flow from small to larger airways up to trachea. This reflex activity is more easily induced in younger infant because of immaturity of their pulmonary receptors. The PSE technique helps in improving oxygen saturation by reducing shrinkage and mobilizing the secretions. Thoraco-abdominal compression and prolonged expiration during PSE technique helps eliminate air trapping. Hence, the increase in the tidal volume and removing 50% of expiratory reserve volume might have normalized the respiratory rate in this infant. The infants' chest are very compliant and resistance to fatigue is low and thus are more prone for respiratory mechanism instability. In such anatomical lung of infants, even a small increase in tidal volume which normalizes the respiratory rate may also normalize heart rate effectively [8].

The PSE technique when combined with medical intervention may help to reduce the length of

hospital stay thereby making it cost effective intervention in management of infants with bronchiolitis. The positive finding of additional PSE technique with medical interventions may heighten the strategy to manage infant with bronchiolitis. Before generalizing this finding, further confirmative randomized control studies with larger sample size are necessary. Well-designed studies are warranted to compare different chest physical therapy interventions with the PSE technique in the management of infant with bronchiolitis.

CONCLUSION

The combination of medical intervention and chest physical therapy in the form of prolonged slow expiration technique may be an effective strategy in the management of clinical signs and symptoms in infants with bronchiolitis. The prolonged slow expiration technique is safe to use in infant when applied correctly. Apart from the positive findings of the combined intervention, it is also cost effective by reducing the length of hospital stay. Further studies are warranted to confirm this finding.

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