

# Effect of chest physiotherapy on oxygen saturation in patients with cystic fibrosis

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## Abstract

Decreasing arterial oxygen saturation has been reported in patients with cystic fibrosis during postural drainage when this was combined with other manoeuvres, which did not, however, include thoracic expansion exercises or pauses for relaxation and breathing control. When these features were included in an active cycle of breathing techniques during postural drainage in 20 patients with cystic fibrosis there was no fall in arterial oxygen saturation during the procedure (mean values 87.1%, 87.9%, and 86.7% before, during, and after treatment).

A fall in arterial oxygen saturation during postural drainage was found in nine patients with cystic fibrosis.<sup>1</sup> While they were in a postural drainage position treatment included chest clapping during tidal breathing, deep breathing, forced expirations, and coughing. Oxygen desaturation appeared to occur most frequently during chest clapping. This was not accompanied by thoracic expansion exercises, and there were no pauses for relaxation and breathing control during the treatment (D Concannon, personal communication). We have studied the effects on arterial oxygen saturation ( $\text{SaO}_2$ ) of postural drainage using the active cycle of breathing techniques.<sup>2</sup>

## Methods

Twenty patients (12 male, 8 female) with cystic fibrosis<sup>3</sup> were studied (table) when receiving antibiotics for an exacerbation of their bronchopulmonary infection. Two patients were receiving continuous oxygen by nasal cannulae and this was maintained during treatment. Bronchodilators were withheld for at least four hours before physiotherapy. Each patient was studied on one day during two sessions of physiotherapy and was positioned for drainage of the most affected segments.

Mean pulmonary function data for the 20 patients

	Mean	Range
Age (y)	26.2	19-34
Arterial blood gas tensions (kPa) (breathing air)		
Oxygen	7.45	4.61-10.00
Carbon dioxide	5.50	3.34-10.01
FEV <sub>1</sub> (l)	1.08	0.60-2.40
Forced vital capacity (l)	2.13	1.00-4.10
Arterial oxygen saturation (%)		
Before treatment	87.1	52.4-95.1
During treatment	87.9	57.4-98.2
After treatment	86.7	54.3-98.5

Postural drainage with the active cycle of breathing techniques was assisted by a physiotherapist. Treatment was continued until sputum was no longer expectorated or until the patient required a rest. An ear oximeter (Ohmeda Biox 3700) was used to record  $\text{SaO}_2$  at 30 second intervals for at least 10 minutes before each treatment, during treatment, and for 10 minutes after treatment. Secretions expectorated during and up to 10 minutes after treatment were collected and weighed with a Harvard trip balance.

Mean  $\text{SaO}_2$  during and after treatment were compared with mean  $\text{SaO}_2$  before treatment by Student's paired *t* test, a *p* value of < 0.5 being accepted as significant.

## Results

There were no significant differences in  $\text{SaO}_2$  between values during or after physiotherapy and those before treatment (table). Patients with a baseline  $\text{SaO}_2$  below 85% showed a pattern similar to that of patients with an  $\text{SaO}_2$  of 85% or more. No patient showed a fall in mean  $\text{SaO}_2$  during treatment of more than 1% from values before treatment; seven patients had a rise of more than 1%. The mean sputum weight during treatment was 15.1 (range 0.5-54.2) g.

## Discussion

The techniques used in this study did not produce a fall in  $\text{SaO}_2$ . There was a marginal increase in  $\text{SaO}_2$  during treatment and a tendency for  $\text{SaO}_2$  to rise during the clapping phase. We conclude that  $\text{SaO}_2$  does not fall during chest physiotherapy when thoracic expansion exercises are combined with chest clapping and sufficient pauses for relaxation and breathing control are interspersed during the active cycle of breathing techniques.

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- 3 Kuzemko JA, Heeley AF. Diagnostic methods and screening. In: Hodson ME, Norman AP, Batten JC, eds. *Cystic fibrosis*. London: Baillière Tindall, 1983:13-21.

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