Use of the lung flute for sputum induction in children with cystic fibrosis: a pilot study

Michael Doumit
Physiotherapy, Sydney Children's Hospital, University of NSW, Australia

Introduction

It is important to obtain sputum samples from children with cystic fibrosis (CF) on a regular basis.

The majority of children that attend outpatient CF clinics are non-productive of sputum.

The lung flute is designed to mobilise sputum from the airways by transmitting acoustic waves (16-22Hz) and PEP (1-2.5cmH2O) through the tracheobronchial tree on exhalation.

The lung flute has been shown to be useful in obtaining sputum samples in non-expectorating adults with suspected pulmonary tuberculosis.

Aim

To assess the effectiveness of the lung flute in obtaining a sputum sample from children with cystic fibrosis (CF) that are unable to produce a sample with coughing alone.

To assess ease of use of the lung flute.

Method

Consecutive children with CF attending an outpatient clinic.

Known ability to expectorate sputum.

Unable to provide a sputum sample with vigorous coughing alone on day of study.

Outcomes

Production of a sputum sample as assessed by presence of a macroscopic sputum plug.

Sputum microbiology.

Ease of use of the device on visual analogue scale.

Results

25 children each used the device on two separate clinic visits.

15 males, mean age 12 (range 6-17), mean FEV1 90% (range 61-132%).

A sputum sample was obtained on 26/50 (52%) occasions.

A sample was obtained on 9/33 (27%) occasions when a child's cough was dry and non-productive.

A sample was obtained on 17/17 (100%) occasions when a child's cough was moist and non-productive.

24/26 samples yielded a positive culture result for at least one known CF pathogen.

Further Results:

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Instructions for use

1. Sit with back straight and head tilted slightly forward.
2. Inhale a little deeper than normal.
3. Blow out through the Lung Flute with the same amount of force as you would use to blow out a candle.
4. Remove mouthpiece and take a quick breath in.
5. Replace the mouthpiece and blow out again.
6. Remove device and wait 5 seconds while taking a couple of normal breaths.
7. Repeat 20 sets of two exhalations each.
8. Wait 5 minutes and then start to cough vigorously and attempt to expectorate mucus.

Bacterial pathogen | Number of samples bacteria isolated in
--- | ---
*Staphylococcus aureus* | 14
*Pseudomonas aeruginosa* | 13
*Haemophilus influenzae* | 3
*Stenotrophomonas maltophilia* | 2
MRSA | 1

Further Results:

Outcome | Median (range)
--- | ---
Ease of use on 10-point VAS | 1 (0-5)
Sputum volume obtained | 0.5ml (0.1-1.0ml)
Time taken to obtain sample | 10 min (2-14min)

Conclusion

The lung flute appears to be a clinically useful and easy device to use for sputum induction in children with CF.

Further research comparing the lung flute to other sputum induction methods in children with CF is warranted.

Acknowledgements

The children and families of the Cystic Fibrosis Clinic at Sydney Children's Hospital, Randwick, Australia.

How easy was the lung flute to use – place a mark on the line

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<tr>
<th>0</th>
<th>5</th>
<th>10</th>
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<tbody>
<tr>
<td>Very easy</td>
<td>Neither easy or hard</td>
<td>Very hard</td>
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