Session 7: Practical session III - Test of Lung Function

Dr. M. L. Fung and laboratory staff

Learning objectives:
1. Measure the respiratory activity and air flow;
2. Distinguish a healthy lung and a sick lung.

One of the commonest means to test the lung function is to measure lung volumes under different conditions. Lung volumes can be measured in a spirogram (as in the diagram below) that is a tracing recorded by an apparatus called spirometer during a succession of respiratory activities including couple quiet breaths (composed of active inspiration and passive expiration) followed by a maximal inhalation and then an exhalation with maximal force. This sequential respiratory movement is called a forced vital capacity maneuver in which you can obtain the tidal volume (TV), inspiratory reserve volume (IRV), expiratory reserve volume (ERV) and vital capacity (VC).

(NOTE: To obtain a spirogram, you need to be sitting down or standing up in a quiescent status with the nose-clip on and breathing to the spirometer through the mouth piece for your own use.)
Part I. Measurement of lung volumes and vital capacity

Tidal volume is the volume of gas inspired or expired in each respiratory cycle. Normal value is about 0.4-0.6 liter.

Inspiratory reserve volume (IRV) is the gas volume in the lung reserved for maximal inspiration from the end of a quiet inspiration. Normal value is about 2-3 liter.

Expiratory reserve volume (ERV) is the gas volume in the lung reserved for maximal expiration from the end of a quiet expiration. Normal value is about 1 liter.

Vital capacity (VC) is the maximal gas volume that can be exhaled from the lungs following a maximal inspiration. Normal value is about 4-5 liter.

I-1. Record the following data for comparisons among your group:

My Age: __________________ (year)
My height: __________________ (meter)
My body weight: __________________ (kg)
My gender: __________________ (M/F)
My tidal volume: __________________ (liter)
My inspiratory reserve volume: __________________ (liter)
My expiratory reserve volume: __________________ (liter)
My vital capacity: __________________ (liter)

I-2. Observations, queries and group discussion for laboratory report:

1. Which of those bio-sketch data (i.e. age, height, etc. can be more than one) is closely related to the high or low values of the vital capacity, and why is so?

2. Do you think exercise can affect your tidal volume, IRV and ERV? If so, how do the values change (increase or decrease), and why is so?
Part II. Measurement of forced expired volume (FEV)

It is useful to evaluate the properties of the respiratory system with the FEV value. In this practical session, it could be estimated by measuring the FEVT value that is the time taken to force out your VC, starting at the end of a maximal inspiration immediately followed by a forceful expiration to exhale maximally (see the figure of spirogram on page 1).

(PRACTICAL NOTE: To be the same as in part I for obtaining the spirogram. Except that when you are testing it with the adapter, the adapter should be placed in between your mouth piece and the spirometry before recording your spirogram.)

(NOTE: In the clinic, the FEV1 value is measured to show your forced expired volume within the first second of expiration. By taking the ratio between FEV1 and FVC, the FEV1/FVC value tells you more accurately the proportional amount of gas being exhaled through the airways for assessing the lung function. You could try to obtain the FEV1/FVC ratio with your spirogram.)

II-1. Record the following data for the calculation:

My vital capacity: _________________ (liter)

My FEVT without the adapter: _________________ (second)

My FEVT with the adapter: _________________ (second)

My VC/FEVT value without the adapter: _________________ (liter/second)

My VC/FEVT value with the adapter: _________________ (liter/second)

II-2. Observations, queries and group discussion for laboratory report:

3. How does the adapter change your VC/FEVT value, and why is so?

4. What lifestyle or environmental factors can lead to similar changes in the respiratory system, and which part(s) of the system is(are) affected by the factors?

Please complete the next page for your laboratory report addressing the above questions or additional points you would like to present in your report And give the report to our laboratory staff before you leave the session.
Department of Physiology, Faculty of Medicine
The University of Hong Kong

Broadening Course: Your Life Style and Your Health (YPHY0001)

Time: 31st October 2007, Wednesday 2:00-3:55 p.m.
Venue: Multidisciplinary Laboratory (MDL1/2/3), Ground Floor, Laboratory Block,
Faculty of Medicine Building, 21 Sassoon Road

Session 7: Practical session III - Test of Lung Function

Student name: _____________________________ (Please print)
Student number: _____________________________
Faculty and year: _____________________________

Total Marks: 10

Laboratory report

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