Welcome to Kyoto and ILSA 2013 on Nov. 14th and 15th. Kyoto is now in the middle of most beautiful and comfortable season. Please enjoy the meeting held in front of the historical Imperial Palace.

ILSA 2013 is the 38th ILSA annual meeting and we are now facing many problems, such as fewer attendants, aging of the researchers and so on. In this meeting we have to discuss about lung sounds while considering future direction of ILSA. In ILSA 2013 you can discuss many new topics, including daily clinical skills to auscultate children and novel automated analysis of lung sounds by new members, as well as many traditional topics from our old friends. I believe our younger new members will lead us to the future lung sounds research.

Luncheon Seminar in the first day was given by Professor Shigeo Wada of Osaka University. He will talk about “Flow-induced sounds in the oral cavity and the branching airway”. His talk will include both technological and medical aspects of lung sounds.

I wish all of you can enjoy the meeting and this beautiful historical city, and also wish this ILSA 2013 can be a spring board to our future development of international lung sound research.

Yukio Nagasaka, M.D., PhD, FCCP
Director
Rakuwakai Kyoto Pulmonary Center
Rakuwakai Otowa Hospital

For the memorial of ILSA 38th in Kyoto, we have a special gift, a memorial handmade mug cup by a popular ceramic artist in Kyoto, Ms. Fumie Fujimoto. As these mug cups are all handmade, there should be a small difference both in color and shape. At registration in the first day, please choose and take one mug cup, which you like most. Ms. Fujimoto will be there and welcome you at registration in the first day morning.

Ms. Fumie Fujimoto is a graduate of Kyoto City University of Arts and has been a popular ceramic artist in Kyoto. Her arts are known to invite good luck and happiness! Her arts are modern but based on a traditional Kyo-yaki (Kyoto Ceramic) style as shown below. We wish this mug cup will bring you good-luck and happiness.

Examples of ceramic arts by Fumie Fujimoto. (small dishes, not mug cups!)
<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Place</th>
<th>Local Organizer(s)</th>
<th>No.</th>
<th>Date</th>
<th>Place</th>
<th>Local Organizer(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>October 1976</td>
<td>Boston, MA</td>
<td>Raymond L.H. Murphy, Jr.</td>
<td>33.</td>
<td>October 2008</td>
<td>Boston, MA</td>
<td>Sadamu Ishikawa &amp;</td>
</tr>
<tr>
<td>4.</td>
<td>September 1979</td>
<td>Chicago, IL</td>
<td>David Cugell</td>
<td>36.</td>
<td>September 2011</td>
<td>Manchester, UK</td>
<td>Ashely Woodcock</td>
</tr>
<tr>
<td>7.</td>
<td>October 1982</td>
<td>Martinez, CA</td>
<td>Peter Krumpe</td>
<td>39.</td>
<td>October 2014</td>
<td>Boston, MA</td>
<td>Sadamu Ishikawa</td>
</tr>
<tr>
<td>8.</td>
<td>September 1983</td>
<td>Baltimore, MD</td>
<td>Wilmot Ball</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>September 1985</td>
<td>Tokyo, Japan</td>
<td>Riichiro Mikami</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>September 1986</td>
<td>Lexington, KY</td>
<td>Steve S. Kraman</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>September 1988</td>
<td>Chicago, IL</td>
<td>David Cugell</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>September 1989</td>
<td>Winnipeg, Canada</td>
<td>Hans Pasterkamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>October 1990</td>
<td>New Orleans, LA</td>
<td>David Rice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>September 1991</td>
<td>Veruno, Italy</td>
<td>Filiberto Dalmasso</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>August 1992</td>
<td>Helsinki, Finland</td>
<td>Anssi Sovijärvi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>August 1993</td>
<td>Alberta, Canada</td>
<td>Raphael Beck</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>September 1994</td>
<td>Haifa, Israel</td>
<td>Noam Gavriely</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>October 1995</td>
<td>Long Beach, CA</td>
<td>Christopher Druzgalski</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>October 1997</td>
<td>Tokyo, Japan</td>
<td>Masahi Mori</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>October 1998</td>
<td>Boston, MA</td>
<td>Sadamu Ishikawa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>October 1999</td>
<td>Marburg, Germany</td>
<td>Peter von Wichert</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>September 2000</td>
<td>Chicago, IL</td>
<td>David Cugell</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>September 2001</td>
<td>Berlin, Germany</td>
<td>Hans Pasterkamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>September 2002</td>
<td>Helsinki, Stockholm</td>
<td>Anssi Sovijärvi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>September 2003</td>
<td>Cancun, Mexico</td>
<td>Sonia Charleston,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>September 2004</td>
<td>Glasgow, Scotland</td>
<td>Ken Anderson &amp; John Earis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>September 2005</td>
<td>Boston/Cambridge, MA</td>
<td>Raymond L.H. Murphy, Jr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>September 2006</td>
<td>Halkidiki, Greece</td>
<td>Leontios Hadjileontiadis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>November 2007</td>
<td>Tokyo, Japan</td>
<td>Shoji Kudoh</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GENERAL INFORMATION

Conference Venue/Accommodation
The Kyoto Garden Palace (http://www.hotelgp-kyoto.com/english/)
(Room “Gion” on the 2nd floor)

Official language: English

Registration
Registration will be held in front of the conference room (Room “Gion”, 2nd floor) on:
Thursday, November 14th  8:30am - 6:00pm
Friday, November 15th  8:30am - 3:00pm

Registration fees
$90 / ¥10000 : (Members/Non-members)
*Note that NO CREDIT CARD will be accepted.
Registration fee includes Get-together party and Lunch.

ILSA annual membership fee
$75 / ¥9000
*Note that NO CREDIT CARD will be accepted.
ILSA members are required to pay the membership fee (if it hasn’t paid yet) followed by the ILSA2013 conference registration fee.

Certificate of attendance
Participants, duly registered, will receive certificates of attendance upon requests.

Social Events
Get-together party will be held on November 14th at Kyoto Garden Palace
(Room “Kurama”, 2nd Floor).
*Business meeting will be held around 3:00pm on November 15th.

Sightseeing tour
Excursion to Eikando, Nanzenji Temple after the luncheon seminar
(13:30-15:30) on November 14th

Supporting Organizations
Rakuwakai Otowa Hospital

Sponsors
Astellas Pharma Inc.
Astrazeneca K.K.
Dainippon Sumitomo Pharma Co., Ltd.
Glaxosmithkline K.K.
Kenzmedico Co., Ltd.
MSD K.K.
Ono Pharmaceutical Co., Ltd.
Pfizer Japan Inc.
Taiho Pharmaceutical Co., Ltd.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session/Activity</th>
<th>Speaker/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30</td>
<td>Registration</td>
<td></td>
</tr>
</tbody>
</table>
| 9:00-9:10 | Opening remarks  
Tadashi Matsumura (President, Rakuwakai Hospitals)   |                                                                                  |
| 9:10-9:40 | History of ILSA, Skype Presentation  
Raymond Murphy (Brigham & Women / Faulkner Hospitals, USA) |                                                                                  |
| 9:40-10:15 | Lung sounds in central airways narrowing  
Michiko Tsuchiya  
(Department of Pulmonary Medicine, Rakuwakai Otsu Hospital, Japan) |                                                                                  |
| 10:15-10:40 | Detailing mechanisms and sites of origin of forced expiratory wheezes  
Vladimir Korenbaum  
(Pacific Oceanologic Institute, Far Eastern Branch of Russian Academy of Sciences, Russia) |                                                                                  |
| 10:40-11:00 | Tea Break                                                                         |                                                                                  |
| 11:00-11:25 | 3 and a half year follow up of 72 year old thriving male with IPF on Pirfenidone therapy  
Sadamu Ishikawa (Steward St Elizabeth Medical Center of Boston, USA) |                                                                                  |
| 11:25-11:50 | Speed of low-frequency surface elastic waves in the human chest wall  
Alexander I. Dyachenko  
(Prokhorov General Physics Institute/Institute of Biomedical Problems of the Russian Academy of Sciences, Russia) |                                                                                  |
| 11:50-12:15 | Some features of sound propagation in human respiratory system  
Vladimir Korenbaum  
(Pacific Oceanologic Institute, Far Eastern Branch of Russian Academy of Sciences, Russia) |                                                                                  |
| 12:30-13:30 | Luncheon seminar  
Shigeo Wada  
(Osaka University, Department of Mechanical Science and Bioengineering, Japan)  
Chairperson: Yoshinobu Iwasaki, (Kyoto Prefectural Medical University, Japan) |                                                                                  |
| 13:30-15:30 | Excursion to Eikando and Nanzenji Temple  !!!!!  
Most beautiful and popular place to enjoy autumn leaves and historical old temple in Kyoto! |                                                                                  |
| 15:30-15:55 | Coherence analysis of breath sounds during bronchial provocation test in children  
Yoon Ha Hwang (National Hospital Organization Fukuoka Hospital, Japan) |                                                                                  |
| 15:55-16:20 | Evaluation of bronchial dysfunction using a new modality of breath sound analysis in asthmatic children  
Chizu Habukawa (Department of Pediatrics, Minami Wakayama Medical Center, Japan) |                                                                                  |
| 16:20-16:45 | Use of blowing toy in the auscultation of younger asthmatic children  
Naruo Saito (Saito Clinic for Asthma and Allergy Children, Japan) |                                                                                  |
| 16:45-17:00 | Tea Break                                                                         |                                                                                  |
Session 4

Chair Persons: 
- Sadamu Ishikawa (Steward St. Elizabeth Medical Center of Boston, USA)
- Michiko Tsuchiya (Department of Pulmonary Medicine, Rakuwakai Otowa Hospital, Japan)

17:00-17:25 
**Lung sounds in children with atelectasis**
Satoshi Adachi
(Department of Pulmonary Rehabilitation, Fukuoka National Hospital, Fukuoka, Japan)

17:25-17:50 
**Breath sounds may reflect lung function in stable adult asthmatics**
Yukio Nagasaka
(Department of Pulmonary Medicine, Rakuwakai Otowa Hospital, Japan)

18:30 
Banquet and dinner at Kyoto Garden Palace Hotel ！！！！

---

Friday, November 15

8:50-9:00 
Welcome remarks
Michiaki Mishima (Director, Kyoto University Hospital, Japan)

Session 5

Chair Persons: 
- Alexander I. Dyachenko (Prokhorov General Physics Institute/Institute of Biomedical Problems of the Russian Academy of Sciences, Russia)
- Makoto Yonemaru (Department of Internal Medicine, Isahara Kyodo Hospital, Japan)

9:00-9:25 
**Development of a new algorithm for the automatic detection and analysis of lung sounds based on the acoustic characteristics**
Sadatomo Tasaka
(Division of Pulmonary Medicine, Keio University School of Medicine, Japan)

9:25-9:50 
**Coherence analysis of lung sounds: Comparison between COPD and normal subjects**
Hiroshi Nakato (Fukuoka National Hospital, Japan)

9:50-10:15 
**Method and apparatus to evaluate acoustic forced expiratory time for screening and monitoring bronchial obstruction**
Vladimir Korenbaum
(Pacific Oceanologic Institute, Far Eastern Branch of Russian Academy of Sciences, Russia)

10:15-10:30 
**Tea Break**

Session 6

Chair Persons: 
- Vladimir Korenbaum
(Pacific Oceanologic Institute, Far Eastern Branch of Russian Academy of Sciences, Russia)
- Yukio Nagasaka
(Department of Pulmonary Medicine, Rakuwakai Otowa Hospital, Japan)

10:30-10:55 
**Breath sounds intensity in COPD patients during tidal breathing**
Akiko Ishimatsu (Fukuoka National Hospital, Japan)
Lung sounds in central airways narrowing

Michiko Tsuchiya, Yukio Nagasaka, Chikara Sakaguchi, Takuma Minami, Ryota Kominami, Tetsuo Hori, Masutaro Ichinose

Department of Pulmonary Medicine, Rakuwakai Otowa Hospital

Introduction
We studied if lung sounds in patients with central airways narrowing could suggest the site or laterality of airways narrowing by using our newly developed two-channel lung sound analysis system.

Methods
Four cases with central airways narrowing were examined. Lung sounds were recorded in upper anterior chest and analysis (LSA) was performed by sound spectrometer, Kenz-Medico LSA 2012. The site and degree of airway narrowing was confirmed by chest CT (computed tomogram).

Results
Case 1: 76 y.o. male with COPD had wheezes in bilateral upper chest. LSA showed bilateral similar wheezes (R>L) and the harmonics of the wheezes in the right side. Chest CT showed marked narrowing of right upper lobe bronchus (RULB).
Case 2: 73 y.o. male with COPD had wheezes in bilateral upper chest. LSA showed bilateral similar wheezes (R>L) and harmonics of the wheezes in the right side. Chest CT showed temporal narrowing of right main stem bronchus (RMSB).
Case 3: 68 y.o. male with silicosis who was mechanically ventilated had wheezes. LSA showed bilateral similar wheezes (R>L) and harmonics of the wheezes in the right side. Chest CT showed narrowing of RULB due to compression by conglomerate mass.
Case 4: 66 y.o. male with lung cancer noted increasing dyspnea. Bronchial breath sounds were heard in the right upper chest. LSA confirmed the findings of auscultation. No wheezes were noted. Chest CT showed narrowing of RMSB. After insertion of metallic bronchial stent, his dyspnea disappeared and breath sounds became normal.

Conclusions
In four cases of central airways narrowing, alteration of lung sounds was observed. LSA was helpful to identify the laterality of airways narrowing. Recording of lung sounds in central airways narrowing was possible in anterior chest and was not difficult even in bed ridden patients. As central airways narrowing is difficult to assess by chest x-ray alone, LSA is considered to be a useful clinical tool in examining patients with possible central airways narrowing. We need further investigation to clarify the mechanisms why wheezes were recorded in some cases and bronchial sound was recorded in another case.

10:55-11:20 The evaluation of the association between sleep disordered breathing and the volume of snoring sounds with a questionnaire in the general medical examination in our hospital
Hiroshi Ono
(The department of general internal medicine, Kosei-Chuo General Hospital, Japan)

11:20-11:45 Accuracy of hearing tests for recorded lung sounds among medical staffs
Kazumasa Yamane (Division of Physical Therapy, Fukuiiji Hospital, Japan)

11:45-12:10 Cardiac response to respiration in smokers and non-smokers
Sadamu Ishikawa (Steward St. Elizabeth Medical Center of Boston, USA)

12:10-13:00 Business Meeting Lunch
DETAILING MECHANISMS AND SITES OF ORIGIN OF FORCED EXPIRATORY WHEEZES

V. Korenbaum1,2, M. Safronova, I. Pochekutov1

1V.I. Tichev Pacific Oceanological Institute FEB RAS; 2Far Eastern Federal University.

Background: An origin of forced expiratory wheezes remains a discussed issue. Korenbaum et al. (2012) studying symmetry/asymmetry of FEWs above lower lung fields found that FEWs of maximal power are produced in bronchial tree more centrally (trachea and principal bronchi) while FEWs of lower power are produced more distally. Revealed dependence of mid-frequency (MF) and early high-frequency (HF) FEWs on gas density was treated as an evidence of flow-dependent mechanism of these FEWs production.

The objective is detailing origin of FEWs by means of study their peak frequency response to bronchodilator test and modeling an influence of forced expiratory airway dynamic compression degree on sites of FEWs origin.

Method: Forced expiratory noises were recorded above trachea by means of developed apparatus (Korenbaum et al., 2008). FEWs were identified in spectrograms. Peak frequencies of the most powerful tracheal FEWs and flows near mouth were measured in the group consisting of 85 healthy and 69 asthma patients with reversible bronchial obstruction (both were young males). The responses of peak frequencies of FEWs and flows to bronchodilator test were compared in healthy and asthma patients. Strouhal numbers were calculated for various levels of bronchial tree (Weibel's dimensions) and few experimental estimates of airway compression degree in healthy.

Results: Lack of response of FEWs peak frequency in the middle of forced expiratory maneuver (near MEF50) to bronchodilator test was found in asthma patients, while significant reduction of FEWs peak frequency was characteristic for healthy. The response of peak frequency of MF (400 - 600 Hz) and early HP (> 600 Hz) FEWs to bronchodilator test observed in the middle of forced expiratory maneuver can be interpreted in favor of flow-dependent mechanism of these sounds production. The behavior is consistent with the predictions of the vortex shedding model. However a response of peak frequency of late HP (> 600 Hz) FEWs to bronchodilator response indicates the possibility of involvement of flow independent auto-oscillatory mechanism. It is evaluated, that in healthy the site of origin of the most powerful FEWs produced by vortex shedding mechanism with Strouhal numbers of 0.2-0.3, is gradually shifted to more central levels of bronchial tree with increase of estimated degree of airway dynamic compression. An application of the most founded experimental estimates of forced expiratory airway dynamic compression in healthy (Brackel et al., 2000; Boiselle et al., 2009 & Litmanovich et al., 2010) results in origin of the most powerful MF FEWs at exit of intra-thoracic part of trachea into its extra-thoracic area as well as at bifurcation of trachea. Meanwhile most powerful early HP FEWs origin may be referred to bifurcations of trachea and principal bronchi.

Conclusions: Revealed features of FEWs origin may be pertinent for medical diagnostics usage. The study was partially supported by the Program of Presidium of Russian Academy of Sciences ‘Fundamental sciences – to medicine’.

3 AND A HALF YEAR FOLLOW UP OF 72 YEAR OLD THRIVING MALE WITH INTERSTITIAL PULMONARY FIBROSIS (IPF) ON PIFERIDONE THERAPY

S.Ishikawa*, S. Izumi (1), S. Kudoh (2), A. Vyshebsky (3), R.L.Murphy (4), P. LaCamera (5) and S. Amat (6)

(1) Pulmonary & Critical Care, Steward St Elizabeth’s Medical Center and Dept. of Medicine, Tufts University School of Medicine, Boston, MA U.S.A.
(2) Dept. of Respiratory Medicine, National Center of Global Health, Tokyo, Japan
(3) Fukujii Hospital, Tokyo, Japan
(4,5) Brigham & Women’s / Faulkner Hospital Boston, MA, U.S.A.
(6) Reliant Medical Group, Worcester, MA., U.S.A.

We have been following a patient diagnosed as Idiopathic Pulmonary Fibrosi (IPF) by Lung biopsy for past 3 and a half years. On the first Consultation 01-04-2010, this 70 year old, Japanese Engineer with a history of heavy smoking, was evaluated because of ‘Crackle’ was heard on ‘Routine Physical’.

He claimed that he was able to climb stairs without difficulties. On auscultation dry Crackles were heard on Right base of the Lung. Peak Flow 500 L/min., FEV1 2.56, FVC 3.04 L. Lung sounds recordings were made with Murphy's STG16., which showed Crackles on both bases but in low intensity. Therefore, ‘Close Observation’ was recommended.. Six months later (06-29-2010), he returned., claiming shortness of breathing on stair climbing. He had bilateral Crackles, 1/3rd up on the Left, and 1/3rd up on the Right.

Lung sound recording showed increase of crackles on intensity and distribution. FEV1 declined to 2.15, and FVC 2.84 L. Tran-Bronchial Right Middle Lobe Biopsy revealed suggestive lesion of IPF.

High dose Steroid therapy was started. Because of further deterioration on Steroid therapy, Pirfenidone was prescribed on 11-25-2010. (initially 1,800 mg/day, which gradually increased to 2,200mg/day.). He came back to Boston on 12-24-2010, Lung sounds recordings showed high intensity of Crackles on both lower zones of the Lung.

On Pirfenidone therapy for over a year, he returned to Boston (01-16-2011). At that point he was able to climb stairs without difficulties.. On examination the chest was remarkably clear. Lung sounds recording confirmed presence of inspiratory and expiratory Crackles of low intensity on Left, Right side was clear. FEV1 improved to 2.84, with FVC of 3.08L.

Then, he returned on 07-03-2013 to Boston (5th visit), claiming he is able to do all daily activities, and off shore fishing for Fluke without any limitations.

* I walked down and up I flight with him without stopping., while monitoring his Oxygen Saturation.

Which declined from 95% (at rest) to 86%, but returned to 95% within 3 min. of rest on chair. (pulse rate changed from 67 to 97/min. and back to 66/min.). His Peak Flow was 520 L/min, FEV1 2.43, FVC 2.74L.

On Auscultation he had very little Crackles on both bases on deep breathing. Lung sounds recording confirmed presence of low intensity Crackles on both bases on deep breathing.

Evolution of the Crackles coincided improved Vital Capacity as well as his Physical Capacity. Therefore, it is worth considering a beneficial effect of Pirfenidone for treatment of IPF, although it is only one case...
SPEED OF LOW-FREQUENCY SURFACE ELASTIC WAVES IN THE HUMAN CHEST WALL

A. Dyachenko1,2,4, E. Timanin3, V. Vasilev3, A. Mikhaylovskaya2, Yu. Semenov1,4

1 Institute of Biomedical Problems of RAS, Moscow;
2 Pirogov General Physics Institute of RAS, Moscow;
3 Bauman Moscow Technical State University, Moscow;
4 Moscow Institute of Physics and Technology (State University), Dolgoprudny,
5 Applied Physics Institute, N.Novgorod, Russia

Introduction: Chest percussion generates propagation of a percussion waveform in the chest wall. Oscillations of chest wall near the tapping area affect the percussion sound. Important characteristics of the oscillations are attenuation and speed of the elastic waves in the chest wall.

The objective of this study was to measure speed of surface elastic waves propagation in the chest wall of normal subjects.

Method: A laboratory setup devoted for a study of low-frequency surface elastic waves in the human chest wall was developed. The setup included a percussion vibrator with accelerometer, the second accelerometer, control block for delivering impulse input to chest wall and registration the chest wall reaction. The setup provided controlled percussion taps of the chest wall and a registration of its acoustical reaction on these impulse inputs. Each tapping test included about 15 s of tapping with 5 taps/s rate. Accelerations of the intender of the percussion vibrator and acceleration of the second accelerometer glued to the chest wall at a distance 2–10 cm from the site of a tap were measured.

Results: In a group of 6 healthy male volunteers aged 20–21 years the phase wave speed in chest wall at vital capacity was studied in following way. On the basis of accelerations we obtained local transfer function for vibrations propagation on the chest wall. For most subjects in the frequency range 30–200 Hz we obtained subbands with coherence of both accelerometers signals about 0.8–0.9. In these frequency subbands there was a specific dependence of transfer function phase upon frequency with phase decrease from +180° to -180° intermittent by phase surges from -180° to +180°. Coherence 0.6-0.7 and the same dependence of phase upon frequency were obtained as well in a higher frequency band 200–400 Hz in a few subjects. This phase-frequency dependence characterizes chest wall oscillations as induced by a traveling wave. Traveling wave speed was 1.42–12.1 m/s, increasing with frequency about 0.05 m/s/Hz.

Tapping waveform transit time (i.e. time delay between accelerations of the plunger and the second accelerometer) was measured in a group of 10 healthy male volunteers aged 20–21 years. Transit time was measured in the sitting position during 3 different maneuvers: residual functional capacity (FRC) maneuver with relaxation of respiratory muscles and open larynx, vital capacity (VC1) maneuver with open larynx and vital capacity (VC2) maneuver with closed larynx and relaxation of the respiratory muscles. Transit time was determined by cross-correlation between signals of the plunger and the second accelerometer with frequency cutoff 1000 Hz. Transit time (mean±SD) was 7.9±3.2 ms, 8.4±3.1 ms, 10.7±3.7 ms in VC1, VC2 and FRC maneuvers respectively. In FRC maneuver transit time was more than in both VC maneuvers (p<0.012 by Wilcoxon signed ranks test). The average group speed estimated as ratio of distance between centers of the plunger and the second accelerometer to transit time was 5.5 m/s, 5.1 m/s and 4.1 m/s for VC1, VC2 and FRC maneuvers respectively. As soon as the sizes of plessimeter and receiver are comparable with the distance, the transit time is a more reliable parameter then estimated group speed.

Conclusions: A significant rise of wave speed with frequency was revealed in chest wall of normal volunteers. Tapping waveform propagates in the chest wall faster at vital capacity then at functional residual capacity.

SOME FEATURES OF SOUND PROPAGATION IN HUMAN RESPIRATORY SYSTEM

V. Korenbaum1,2, A. Shirova1, A. Tagilov2, D. Vlasov2, S. Gorovsky2, S. Kamenev2

1 V.I. Ilichev Pacific Oceano1cal Institute FEB RAS; 2 Far Eastern Federal University.

Background: Sound propagation in human respiratory system remains poorly studied. Korenbaum et al. (2010, 2011) experimentally revealed two sound transmission mechanisms being involved simultaneously. The first mechanism was determined as air-structural transmission while the second mechanism was referred to pure structural one.

The objective is a study of sound propagation features including spectral characteristics of these mechanisms, evaluation of distance of wheezing sources for structural propagation, estimating sound speed of structural propagation in frequency band of 10–20 kHz.

Method: The laboratory installation was developed, which included loudspeaker and small vibration source, fed through an amplifier from an output of sound card of laptop, a system of acoustic sensors, connected to analog inputs of 16-channel computer laboratory PowerLab (ADInstruments). Frequency sweep signals were used for injection into mouth or into supraclavicular area of thorax. Wheezes during spontaneous inspiration and forced exhalation were recorded too. Cross-spectral phase, convolution and intensimetric techniques were applied to evaluate signal parameters.

Results: The entire frequency band of low frequency transmission from mouth to various areas of lung is separated into 2 frequency areas – the first one of about 90–280 Hz is characteristic for both air-structural and structural mechanisms, while the second one of about 280–500–700 Hz is characteristic only for air-structural mechanism. In other words the revealed previously phenomenon of two sound transmission mechanisms in frequency domain has certain selectivity being that approximately the same selectivity in frequency domain was found in independent study by means of intensimetric processing of respiratory noises and transmitted human voice (Korenbaum et al., 2003).

The intensimetric processing involving cross-spectrum calculation of coaxially arranged microphone and accelerometer sensors is applied here to evaluate a distance of wheezing sources from chest surface. The mathematical model is developed for transverse quadrupole source emitting through lung parenchyma, which provides the distance estimation by means of calculating the ratio of imaginary and real parts of cross-spectrum. Nine wheezes with various frequencies are recorded above right basal area of healthy volunteer (inspiration and forced exhalation). The distances of 6 wheezing sources seem to be in concordance with anatomic considerations. Three wheezes during inspiration (175, 234, 322 Hz) have wavelengths 1.3 cm. Such wavelengths seem to be resolved by means of high resolution visualization of pathologic inhomogeneities in lung tissue.

Conclusions: Revealed features of sound propagation probably may be pertinent for transmission-emission acoustic tomography of human lungs. The study was partially supported by the grant 13-08-00010-a of Russian Foundation for Basic Research.
Coherence analysis of breath sounds during bronchial provocation test in children

Yoon Ha Hwang, Hiroshi Odajima, Hiroshi Nakano

Fukuoka National Hospital, Fukuoka, JAPAN

Background: In normal adults, breath sounds on the chest wall in the expiratory phase are generated from central airway and those in inspiratory phase are produced at more peripheral sites (lobar–segmental bronchus). In asthmatic patients, many studies indicate breath sounds change in frequency distribution during bronchial provocation test (BPT), of which underlying mechanism is unknown. We investigate coherence of lung sounds with tracheal sound during BPT to elucidate the mechanism.

Methods: Subjects were well-controlled asthmatic male patients of 5 to 15 years old. During BPT, we recorded the breath sounds and analyzed using FFT. We obtained the coherences between tracheal sound (as reference) and lung sounds at six chest locations. Data which contained wheezes were excluded from the analysis.

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>BMI</th>
<th>ACT</th>
<th>FeNO (ppb)</th>
<th>RT20</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>139</td>
<td>38</td>
<td>19.7</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>117</td>
<td>22</td>
<td>16.1</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>138</td>
<td>31</td>
<td>16.3</td>
<td>26</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>167</td>
<td>65</td>
<td>23.3</td>
<td>23</td>
<td>48</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
<td>164</td>
<td>57</td>
<td>21.2</td>
<td>21</td>
<td>51</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>133</td>
<td>30</td>
<td>17</td>
<td>26</td>
<td>86</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
<td>168</td>
<td>52</td>
<td>18.4</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>13</td>
<td>172</td>
<td>62</td>
<td>21</td>
<td>25</td>
<td>159</td>
</tr>
<tr>
<td>9</td>
<td>13</td>
<td>167</td>
<td>77</td>
<td>27.6</td>
<td>25</td>
<td>69</td>
</tr>
<tr>
<td>10</td>
<td>14</td>
<td>161</td>
<td>46</td>
<td>17.7</td>
<td>25</td>
<td>32</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>146</td>
<td>35</td>
<td>16.4</td>
<td>25</td>
<td>12</td>
</tr>
</tbody>
</table>

Results:  
1. Expiratory breath sounds Coherence (400–800 Hz) changed from before test (average 17.0%) to RT20 (respiratory threshold 12.0%) and after bronchodilator use (15.4%). These changes are statistically significant (p<0.01)
2. Inspiratory breath sounds Coherence changed from before test (average 27.7%) to RT20 (17.3%) and after bronchodilator use (29.7%). These changes are statistically significant (p<0.01)

Conclusions: Coherence analysis suggested peripheral shift of breath sounds origin during BPT. It is more prominent in inspiration.

---

Evaluation of bronchial dysfunction using a new modality of breath sound analysis in asthmatic children

Chiyo Habukawa, M.D., Katsumi Murakami, M.D., Yukio Nagasaka, M.D.

1Department of Pediatrics, Minami Wakayama Medical Center,  
2Department of Pediatrics, Kinki University Sakai Hospital,  
3Department of Pulmonary Medical Center, Otowa Hospital

Background: Reliable assessment of symptoms, lung function and effect of ICS treatment is essential in asthma management. We developed new technology for analyzing breath sounds and assessed its clinical usefulness in asthmatic children.

Methods: One hundred thirty five asthmatic children and 16 non-asthmatic children underwent breath sound analysis and lung function test in asymptomatic state. In asthmatic children, their asthma control was assessed by Asthma Control Test™ or Childhood ACT.™ Breath sounds were recorded using a sensor, located on right upper anterior chest. We calculated an index of breath sound parameter from an amplitude at mid frequency range (iM – the index of mid range). Influence of flow and body size were reduced from the iM. The iM were compared with spirometric parameters and ACT or C- ACT scores. In addition, the 120 asthmatic children who were being not treated with ICS (inhaled corticosteroid) were started to treat with ICS, all patient were performed these tests at least 3 times during 12 weeks and they were evaluated before, between and after treated with ICS.

Results: There was a significant difference of iM between asthmatic children and non-asthmatic children and iM correlated with classification of asthma severity. (p<0.01, p<0.05, respectively). The iM correlated with FEV1.0%, MMF and FEF50 (p<0.05, 0.01, 0.05, respectively). The iM of 120 asthmatic children decreased significantly in comparison with that of before ICS treatment. (p<0.05). In addition, the iM of the patients who still had respiratory symptoms after ICS treatment was significantly higher than that of asymptomatic patients after ICS treatment (p<0.01).

Conclusions: It was possible to evaluate bronchial dysfunction and control level of asthma by a new index calculated from breath sound analysis.
Use of blowing toy in the auscultation of younger asthmatic children

Naru Saito, M.D.

Saito Clinic for Asthma and Allergy Children

**Background:** Younger children do not give breath until the end of expiration even during auscultation because they cannot understand the instruction of the doctors. We use blowing toy in the auscultation of younger asthmatic children and studied if the use of this toy may encourage expiration and makes auscultation of expiratory wheezes easier.

**Methods:** Breath sounds were recorded while children were playing with pinwheel, a blow-up ball (ball) or a blow-up thread (thread) and then analyzed by a sonogram. Seventy seven (among 101) physicians answered the questionnaire on the efficacy of blowing toys.

**Results:** Sonogram showed a low inspiratory-expiratory time ratio (IE ratio) and the greatest dispersion when the pinwheel was used. The highest IE ratio but large dispersion when the ball was used, and higher IE ratio and the smallest dispersion when the thread was used. Questionnaires showed that physicians rated the thread most highly for auscultation of breath sounds and wheezing. Physicians pointed out that the ball was difficult to handle and involved the risk of accidental ingestion.

**Discussion:** The present study showed that children repeated forced respiration regularly to the end of expiration while playing with the thread. Questionnaires have also revealed that the thread was rated highly as an aid to auscultation. This toy is expected easy to hear wheezing at the end of expiration and more reliable asthma management in children.

---

Lung sounds in children with atelectasis

Satoshi ADACHI, Hiroshi NAKANO, Hiroshi ODAIMA, Chikako MOTOMURA

1Department of Pulmonary Rehabilitation, Fukuoka National Hospital, Fukuoka, Japan,
2Department of Pulmonary Medicine, Fukuoka National Hospital,
3Department of Pediatrics, Fukuoka National Hospital

**Background:** Atelectasis is a common complication of pneumonia and asthmatic attack in children. It occurs predominantly in the right middle lobe. The purpose of this study is to elucidate characteristics of the lung sounds in children with atelectasis and the change in the recovery process.

**Method:** Lung sounds were recorded in 13 patients with right middle lobe atelectasis (3-7 y.o) and 18 healthy children (3-7 y.o) as controls. We recorded lung sounds using an IC recorder with two air-coupled microphones and analyzed the data using a personal computer (PC). Microphones were placed on the both 5th intercostal space on the mid-clavicular line (R and L). Lung sounds were recorded about 30 seconds during slow deep breathing in supine position. The recording was performed before and after a course of chest physiotherapy. We calculated lung sound power spectra using FFT on the PC.

**Results:** In the atelectasis patients, the inspiratory sound intensity of R was significantly lower than that of L in all frequency bands (P<0.01). Furthermore, the R to L difference was greater in the patient than in normal subjects (Fig.1: P<0.01). The inspiratory sound intensity of R increased significantly after the atelectasis was resolved as compared with that before the treatment, but the R to L difference was remained except for the frequency band of 100Hz – 200Hz (fig.2; P<0.05). The expiratory sound intensity was not different between the both sides, and it did not change after the treatment.

**Conclusions:** Inspiratory breath sound intensity decreased at the site of atelectasis, and it increased with atelectatic improvement. However, breath sound intensity of particular frequency bands remained to be decreased even after the atelectasis was resolved on X-ray, suggesting that persistent structural change relating to atelectasis affects the generation or transmission of the sound.

Lung sound analysis may be useful for bedside evaluation of improvement process of atelectasis.
Breath sounds may reflect lung function in stable adult asthmatics

Yukio Nagasaka1, Terufumi Shimoda2, Michiko Tsuchiya2, Chikara Sakaguchi2, Takuma Minami3, Ryota Kom innami2, Tetsuo Hori2, Masutaro Ichinose1

1Department of Pulmonary Medicine, Rakukakai Otowa Hospital,  
2Department of Clinical Research National Fukuoka Medical Center

Introduction

Many studies of experimentally induced airway narrowing showed that an increase of frequency and power of breath sounds may be more sensitive than wheezes to detect airway narrowing. In this study, we evaluated if the changes of lung sounds may reflect lung function of stable asthmatic subjects.

Subjects and Methods

Thirty-six asthmatics (aged 41±13 years) underwent breath sound analysis and lung function tests when they had no asthmatic symptoms. Breath sounds were recorded in the right posterior chest and analyzed by sound spectrometer. We measured average sound power of low frequency range (LF: 100 to 195 Hz) during inspiration (I), expiration (E) and their ratio (E/I) as reported in ILSA 2011.

Results

E/I negatively correlated with FEV1% (FEV1/PrFEV1×100, p < 0.001), %FEV1 (FEV1/PrFEV1×100, p < 0.001). (Figure)

Conclusions

It will be possible to assess pulmonary function from breath sound analysis in stable asthma. Clinically, when the patients have well audible expiratory breath sounds or bronchial breath sounds, they may have obstructive airways dysfunction. Breath sounds may be useful in the evaluation of stable adult asthmatics.

Development of a new algorithm for the automatic detection and analysis of lung sounds based on the acoustic characteristics

Sadatomo Tasaka1, Tomoko Betsuyaku1, Masato Sugano2, Makoto Yonemaru1, Tadashi Abe

1Division of Pulmonary Medicine, Keio University School of Medicine,  
2Core Technologies Development Department, CE Strategic Business Planning Operation, JVC KENWOOD Corporation,  
3Department of Respiratory Medicine, Isehara Kyodo Hospital,  
4Department of Respiratory Medicine, Tokai University School of Medicine

[Background] Listening and interpreting lung sounds by a stethoscope has been an important component of screening and diagnosing lung diseases. However, this practice is vulnerable to poor quantitativity, inter-observer variations and poor reproducibility. In this study, we aimed to develop a new algorithm for the automatic detection and analysis of lung sounds based on the acoustic characteristics.

[Methods] In 57 patients with interstitial pneumonia, bronchiectasis, and other chronic pulmonary diseases, lung sounds were recorded with a stethoscope microphone on the chest. The acoustic data was analyzed using a new algorithm based on the acoustic characteristics.

[Results] After filtering between 500 and 4,000 Hz, the envelope of the wave was obtained with Hilbert transform. The envelope was smoothed using curve approximation and the second derivatives were obtained to identify the inhalation and exhalation. Crackles were successfully detected with statistical correction of the peaks of the envelopes. Continuous sounds were identified from the frequency distribution obtained with a fast Fourier transform. The frequency distribution was associated with the pitch and monophony/polyphony of the lung sounds.

[Conclusion] Our new algorithm successfully detected and analyzed the lung sounds based on the acoustic characteristics. It is indicated that the lung sounds could be visualized and quantitatively assessed with the algorithm. Because the algorithm can be implemented in a smartphone application, it may be utilized for home medical care or telemedicine.
Coherence analysis of lung sounds: Comparison between COPD and normal subjects
Hiroshi Nakano, Akiko Ishimatsu, Tomonki Iwanaga
Fukuoka National Hospital, Fukuoka, JAPAN

Background: We have reported enhanced high frequency component in COPD lung sounds (Sano 1998, Ishimatsu 2013). Ishimatsu is presenting an interesting finding for 400-800Hz bandwidth was obtained. We have reported enhanced high frequency component in COPD lung. These results suggest more peripheral origin of sound generation in COPD patients as compared with normal subjects.

Methods: Subjects were 16 normal subjects and 12 COPD patients. Tracheal sounds and lung sounds at six sites (R&L-upper, R&L-middle, R&L-lower) during deep breathing were analyzed separately for inspiratory and expiratory segments (0.5 s). Cross spectra and power-spectra of two sites were calculated using FFT (0.082 s window: 25% overlapping) and averaged to calculate coherence function, from which a coherence value for 400-800Hz bandwidth was obtained.

Results
1. Inspiratory breath sounds:
Coherence functions between lung sounds at six sites and tracheal sounds were not different between normal subjects and COPD patients (Fig.2). However, coherence of 400-800 Hz bandwidth between R-upper and R-middle was greater in COPD patients than in normal subjects (Fig.1: p=0.038). The lung sounds power of 400-800Hz was greater in COPD patients when compared with normal subjects at equivalent airflow. These results suggest increased high frequency sound transmission property of COPD lung.

2. Expiratory breath sounds:
Coherence functions between lung sounds at six sites and tracheal sounds were greater in normal subjects than in COPD subjects (Fig.2). On the other hand, the ratio of expiratory lung sounds power to tracheal sound power was greater in COPD patients than in normal subjects (-26dB vs. -35dB: p=0.0025; Fig.3). These results suggest more peripheral origin of sound generation in COPD patients as compared with normal subjects.

Conclusion: Enhanced high frequency lung sounds in COPD patients may be due to increased intrapulmonary sound transmission (inspiration) and / or peripheral shift of sound generation sites (expiration).

METHOD AND APPARATUS TO EVALUATE ACOUSTIC FORCED EXPIRATORY TIME FOR SCREENING AND MONITORING BRONCHIAL OBSTRUCTION
V. Korenbaum, I. Pochekutova, A. Kostiv, A. Tagitsev, S. Shubin

1 V.I. Itichev Pacific Oceanological Institute FEB RAS; 2 Far Eastern Federal University.

Background: Increased forced expiratory time was first recognized as a marker of obstruction about half a century ago. However, the reported diagnostic capabilities of both auscultated forced expiratory time (FETas) and spirometric forced expiratory time (FETs) are contradictory. Computer analysis of respiratory noises provides a precise estimation of acoustic forced expiratory noise time (FETas) being the object-measured analogue of FETas.

The objective of this study is to develop acoustic method to evaluate FETas and analyze its diagnostic capabilities in screening and monitoring bronchial obstruction.

Methods: The apparatus is developed which contains acoustic sensor, input device, portable personal computer and specially designed software. The acoustic sensor (microphone with stethoscopic head) is attached to lateral neck surface. It was found that FETas is directly proportional to bronchial resistance under forced exhalation. FETas values were estimated by means of developed computer procedure, including bandpass filtration (200–2000 Hz), waveform envelope calculation with accumulation period of 0.01 s, automated measurement of FETas at 0.5% level from the peak amplitude. A group of asthma patients involved 149 males aged 16–25 years was studied. In this group, 71 subjects had spirometry features of bronchial obstruction, meanwhile, the remaining 78 had normal spirometry. A control group involved 77 healthy subjects. Spirometry and forced expiratory tracheal noise recording were sequentially made for each participant.

Results: Specificity, sensitivity and area under Receiver Operating Characteristic curve of FETas and its ratios to squared chest circumference, height, weight were indistinguishable with baseline spirometry index FEV1/FVC in training sample, consisting of healthy and asthma patients with spirometry confirmed obstruction. Meanwhile, acoustic features of obstruction were revealed in 41% – 49% of subgroup of patients with asthma, having normal spirometry. The method was also successfully used for monitoring lung function of divers after immersion (Pochekutova, Korenbaum, 2011) and the crew of MARS-500 International Experiment (Dyachenko et al., 2012). The developed technology and instrumentation is informative, simple, and cheap. Moreover it completely excludes a danger of between-subject respiratory infection, making bronchial obstruction revealing possible even in a field conditions.

Conclusions: FETas test of tracheal noise seem to be sensitive and specific instrument to reveal and monitor bronchial obstruction in young males. The study was partially supported by the Program of Presidium of Russian Academy of Sciences 'Fundamental sciences – to medicine'.
Breath sounds intensity in COPD patients during tidal breathing

Akiko Ishinose, Hiroshi Nakan, Tomoaki Iwanaga

Fukuoka National Hospital, Fukuoka, JAPAN

Background Breath sounds intensity in COPD patients is believed to be diminished. Previous studies on this issue were performed using airflow-standardized measurement of breath sounds or auscultation assessment at a nearly maximal breath. Thus, knowledge about the breath sounds intensity during subjects' usual breathing is lacking.

Objective To elucidate whether breath sounds intensity in COPD patients is diminished or not during tidal breathing.

Method Subjects were 20 stable COPD patients and 20 normal controls. Microphones were attached to six sites on the chest wall. Measurement of breath sounds along with airflow at the mouth was done in a sitting position during tidal breathing and thereafter deep breathing. Power spectra of breath sounds were obtained using a fast Fourier transform.

Results During tidal breathing, breath sounds intensity during both inspiration and expiration was significantly greater in COPD group than in control group at all frequency bands, regardless of the recording site. The intensity during expiration was positively correlated with CT visual emphysema score but not with FEV1.0. Airflow at resting breathing was not different between the two groups. During deep breathing, inspiratory breath sounds intensity at the dominant frequency band was diminished over the upper and middle lung fields. However, the intensity during expiration was not diminished. Airflow during deep breathing was reduced in the COPD group as compared with the control group.

Conclusion Breath sounds intensity during tidal breathing is increased in COPD patients as compared with normal subjects.

The evaluation of the association between sleep disordered breathing and the volume of snoring sounds with a questionnaire in the general medical examination in our hospital

Hiroshi Ono, Naoyuki Kitagawa, Michio Sakurai

The department of general internal medicine, Kosei-Chuo General Hospital

Background and purpose Although snoring has a close association with sleep disordered breathing (SDB), there is few study about the association between the volume of snoring sounds and SDB. In the general medical examination in our hospital, we perform the checkup about SDB with a questionnaire and a portable device which monitors oxygen saturation (SpO2) and a pulse. In the present study, we evaluated whether the volume of snoring sounds associate with SDB in the testees in our general medical examination. [Subjects and methods] The subjects are 346 consecutive persons (249 men and 97 women) who were hospitalized for the general medical examination in our hospital from 19 April to 24 July, 2013. The subjects were assigned into 3 groups: the non-snore (NS) group including the 76 persons who answered that they didn’t snore on the questionnaire, the non-loud snore (NLS) group including the 136 persons answered that they snored but their volume of snoring sounds were as loud as, or lower than that of their speech and the loud snore (LS) group including the 134 persons who answered that the volume of their snoring sounds were louder than their speech. Among 3 groups, we compared 3% oxygen desaturation index (ODI), the length of the duration in which SpO2 was below 90% (DSpO2<90%), the median level of SpO2, the lowest level of SpO2 and the ratio of the persons who were diagnosed SDB. The criteria of diagnosing SDB we assumed were 3%ODI≧15, or 15≧3%ODI≧5 and Epworth Sleepiness Scale≧11. [Results] As for 3%ODI, the median and the lower level of SpO2 and DSpO2<90%, LS group was significantly higher than other groups although there was no significant difference between NS group and NLS group. In addition, in LS group, the ratio of the persons diagnosed SDB was 32%, significant higher than both of NS and QS groups, in which the ratio was 9%. [Discussion] It is supposed that if the volume of snoring sounds is louder than that of speech, it is associated with SDB, but there is poor association between SDB and snore of which the volume is lower than speech's volume.
Accuracy of hearing tests for recorded lung sounds among medical staffs

Kazumasa Yamane1, Estuko Asai2, Youko Kuwahara1, Jyuri Fukuda1, Satoshi Takao2, Daiusuke Tamon1, Natsumi Hoshino1, Shoji Kudoh2

1)Division of Physical Therapy, 2)Respiratory Medicine, Fukuijju Hospital, Tokyo

Background: The lung auscultation is an important method for disease diagnosis, patient condition assessment and evaluating effects on pulmonary rehabilitation intervention. However, the sounds heard through a stethoscope are various, and it is sometimes difficult for medical staff to classify lung sounds heard from patients accurately. Therefore, we studied how many medical staffs could correctly classify recorded lung sounds* when they listened from CD player randomly.

Method: 77 medical staffs (16 doctors, 55 nurses, 6 physical therapists) participated in this study. The medical staffs listened to seven kinds of lung sounds (vesicular breath sounds, tracheal breath sounds, rhonchi, wheezes, coarse crackles, fine crackles and pleural friction rub) from CD player randomly, and choose a single answer among these seven sounds.

Result: Accuracy of hearing tests as follows: vesicular breath sounds 52%, tracheal breath sounds 47%, rhonchi 88%, wheezes 87%, coarse crackles 55%, fine crackles 43% and pleural friction rub 38%.

Discussion and Conclusion: Many staffs answered vesicular breath sounds and tracheal breath sounds adversely. It might influence to lung sounds distinction that a border between inspiration and expiration was unclear by the recorded sounds. However, differentiation of these sounds is also important to notice “the change to bronchial breath sounds from vesicular breath sounds”, and it is necessary to understand the characteristics of normal breath sounds. In addition, among adventitious sounds, although accuracy was high about the rhonchi and wheezes, a correct answer rate was low on the coarse crackles, fine crackles, and pleural friction rub. Many staffs confused these three sounds. Needless to say, not only generating mechanism but also clinical meaning of these three sounds is different.

We will start re-education on lung sounds for medical staffs and would like to try again this hearing test after the re-education.

* Yonemaru R, et al: Auscultation training on respiratory sounds by CD for nurses, 2001, Nankodo, Tokyo, Japan

---

CARDIAC RESPONSE TO RESPIRATION IN SMOKERS AND NON-SMOKERS

Sadamu Ishikawa1, Andrey Vyshedskiy2, Raymond LH Murphy3 and Peter LaCamera2

1) Pulmonary & Critical Care, Steward St Elizabeth's Medical Center, Dept. of Medicine Tufts University School of Medicine, Boston, MA U.S.A.

2,3) Brigham & Women’s/ Faulkner Hospital, Boston, MA U.S.A.

It has been said that the Heart beat becomes slower on Inspiration, when one takes a deeper breath, more negative pressure within the Chest is generated which leads to more blood returning to the Left Ventricle, hence a delay of the next Heart beat.

We used a 2 channel ECG / Lung sounds to simultaneously record ECG and Tracheal sounds. ECG (QRS) was used to identify Heart beat and Lung sound tracing was used to monitor breathing.

All recordings were done at sitting position. Two ECG electrodes were mounted on anterior Chest, at the level of 3rd inter-costal space on both sides of Sternum, and the 3rd electrode on the lower part of the Left side of the Chest. Tracheal sounds were recorded while listening by Stethoscope on the Neck.

After 2 or 3 regular breathing, the subject was instructed to take a deep breath and hold for few seconds

Recording of ECG and Tracheal sounds were made during that period. In order to ensure reproducibility, the same maneuver and recordings were made 4 times on each subject at one sitting.

Measurements of QRS interval of 2 beats during Inspiration, and QRS interval of 2 beats before Inspiration were made.

Forty non-smoking subjects showed larger QRS intervals during Inspiration (47 msec.) comparing to shorter 2 QRS intervals (34 msec.), and the ratio was 1.34.

Four subjects had 3 visits of 4 recording sessions. The ratios were averaged at 1.34, 1.43, 1.53 and 1.33.

Fifteen subjects who were healthy but currently smoking, there were no significant difference of 2 QRS intervals during Inspiration (36 msec.) and before the Inspiration (37 msec.) and ratio was 0.97.

There was a clear evidence of slowing of Heart beat during deep Inspiration in Healthy non-smoking subjects which was not observed in Healthy smokers.
MEMO

SOCIAL PROGRAM

1. Eikando and Nanzenji Temple
13:30-15:30, November 14th, 2013

Bus transfer at 13:30

Most beautiful and popular place to enjoy autumn leaves and historical old temple in Kyoto!

2. Banquet and dinner at Kyoto Garden Palace
18:30-, November 14th, 2013

1. Eikando and Nanzenji Temple
2. Banquet and dinner at Kyoto Garden Palace
第39回肺音（呼吸音）研究会 演題募集のご案内

平成25年10月26日（日）15:00～18:00
場所：なら100年会館 小ホール（改札を出て西出口すぐ）
〒630-8121 奈良市三条宮前町7番1号 TEL: 0742-34-0100
(http://www.nara100.com/acs.html)
主催：肺音（呼吸音）研究会
参加費：1,000円
演題募集：特にテーマを設けません。肺音（呼吸音）に関する症例なら受け付けさせていただきます。
症例発表をご予定の先生は、研究会事務局メールアドレスよりご登録をお願いいたします。
プログラム作成のため、メール本文に演題名、筆頭演者、共同演者、所属を明記の上、発表者のメールアドレスに連絡が取れる電話番号を明記の上、送信してください。
*演題受付のメールは折り返し事務局よりご返信させて頂きます。

演題募集期間 平成26年8月19日（火）～平成26年9月18日（木）
演題応募先メールアドレス 肺音（呼吸音）研究会 haion@coac.co.jp

たくさんのご応募をお待ちしております。

以上

拝啓
秋冷の候 益々ご健勝のこととお慶び申し上げます。平素は当研究会に格別のご高配を賜り厚く御礼申し上げます。
さて、第39回肺音（呼吸音）研究会の開催にあたり下記のとおり演題を募集いたします。
多くの皆様に症例提示をいただき、有意義な討論の時間が持てればと考えております。
ご多忙の折とは存じますが、宜しくご配慮の上、ご出席くださいますようお願い申し上げます。
末筆ながら、先生のご健勝を心から祈念申し上げます。
敬具
第37回肺音（呼吸音）研究会
当番幹事 長 澄人
（済生会吹田病院 呼吸器病センター長）

一日程：平成26年10月26日（日）15:00～18:00

記

Boston, in front of MIT

The program will be held in Boston on Oct. 10th (Fri) & 11th (Sat), 2014, at Steward St Elizabeth's Medical Center in Boston.
第4回肺聴診セミナーのご案内

【第1報】

拝啓　晩秋の候、益々ご清祥のこととお慶び申し上げます。平素は当研究会に格別のご高配を賜り厚く御礼申し上げます。

さて、第4回肺聴診セミナーは下記の通り開催の予定です。プログラムは未定ですが、例年の内容に則して肺聴診に携わる全ての職種の皆様の診療に役立つセミナーとする予定です。

ご多忙の折とは存じますが、皆様のご参加をお待ち申し上げております。

敬具

平成25年10月吉日

第4回肺聴診セミナー講習会長　長　澄人
(済生会吹田病院　副院長　呼吸器病センター長)

記

日　程：　平成26年10月26日（日）10時00分～
（受付開始9時30分より）
場　所：　なら100年会館　小ホール　（JR奈良駅改札を出て西出口すぐ）
〒630-8121　奈良市三条宮前町7番1号　TEL：0742-34-0100
（http://www.nara100.com/acs.html）

講習会長：　長　澄人（済生会吹田病院　副院長　呼吸器病センター長）
主　催：　肺音（呼吸音）研究会
定　員：　100名
参　加　費： 事前参加登録　8,000円（昼食・テキスト代含む）
　　当日参加登録　10,000円（昼食・テキスト代含む）

以上

肺音（呼吸音）研究会ホームページ　http://coac.jp/haion/
AstraZeneca

医療の「A」から「Z」まで。

AstraZeneca

お客様の健康が
何よりも大切です。