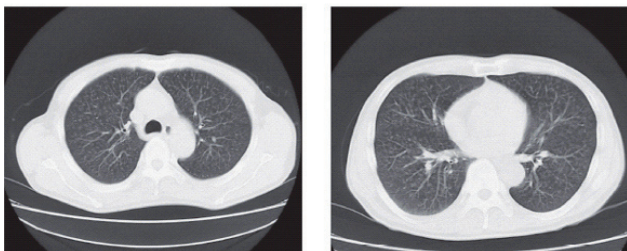
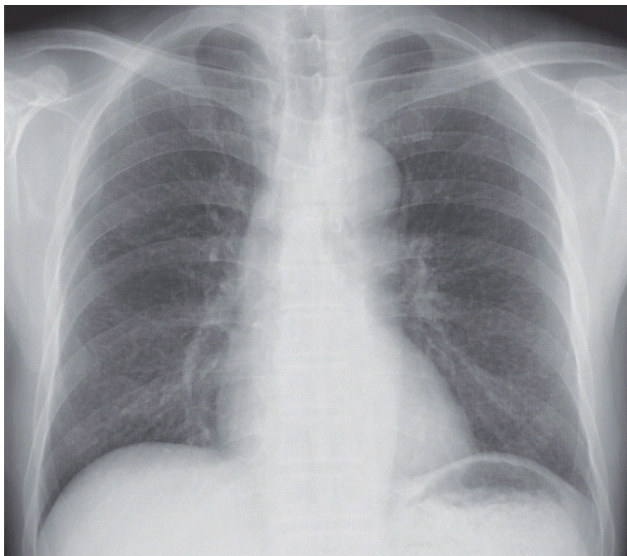


Development of New Diagnostic Imaging Method and Compilation of Photo Collection of Various Types of Dust and Occupationally Categorized Coniosis

Field name "Respiratory diseases due to dust inhalation"

Although it was thought that there were no new cases of pneumoconiosis and that it was a disease in the past, recently a new type of pneumoconiosis has emerged as a new problem afflicting welders (Fig. 24) and dental technicians. In regard to the chest x-ray images for these cases of pneumoconiosis, we present findings specific to dust that was inhaled, and in order for many specialists to become aware of the characteristics, we created two volumes. One compiles chest x-rays of the latest cases of pneumoconiosis according to the occupation and is called "Compilation of image based examinations of pneumoconiosis cases according to current occupations"² and the other provides a simple explanation to medical practitioners called "Compi-



lination of image based examinations of current pneumoconiosis cases"³. From Rosai hospitals from all over Japan, we collected chest x-rays of the latest pneumoconiosis cases based on occupation.

Although we can recognize faint small ground glass patch shadows around the ends of the centrilobular bronchial tubes in the CT, clear granular shadows are scarce. We also recognize a mild increase in the branching shadows.

Fig. 24. Example of welder's lung in a 55 year old electric welder with 38 years of experience.

lation of image based examinations of current pneumoconiosis cases"³. From Rosai hospitals from all over Japan, we collected chest x-rays of the latest pneumoconiosis cases based on occupation.

The number of cases of pneumoconiosis complicated with lung cancer is increasing and in order to diagnose accurately the shadow of newly emerging lung cancer in pneumoconiosis cases with complicated chest x-rays, we established the temporal subtraction technique so that we can accurately and quickly diagnose pneumoconiosis complicated with lung cancer^{1, 4, 5, 6}.

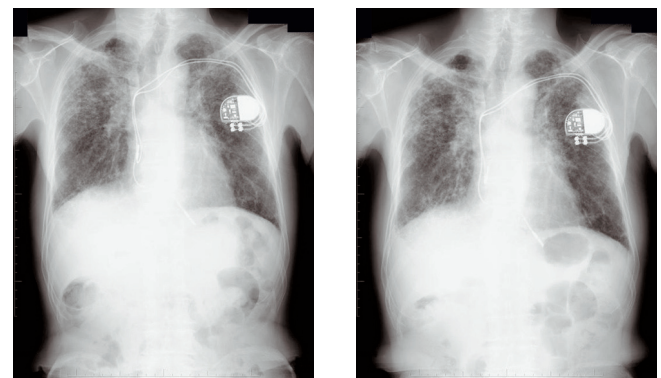
We also successfully established the 3D CT method to obtain 3D images^{1, 4, 7, 8} of pleural plaque and a differential diagnosis method for coniotic nodules and lung cancer based on PET^{1, 9, 10}.

Temporal Subtraction Technique

Finding the new shadowed area that emerges between the 2 chest x-ray images of pneumoconiosis in Fig. 25 is quite difficult, but as shown in Fig. 26, by utilizing computers to generate a subtraction image from the two chest x-rays, we can render the new shadow generated by the two images. By employing these types of methods, detecting new shadowed areas in cases of pneumoconiosis becomes easier.

Pleural plaque images based on 3D CT method

As shown in the horizontally sliced simple CT image



Taken Oct. 2004

Taken March 2005

Fig. 25. Chest X-rays of a 78 year old patient with a 34 year history as a coal miner

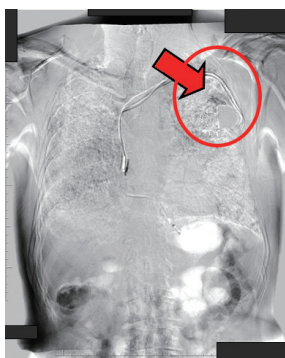


Fig. 26. Image generated by subtracting 2 chest x-ray images.
The shaded area of the pneumoconiosis was hidden by the shaded area of the lung cancer (red arrow)



Fig. 28. Pneumoconiosis complicated by lung cancer indicated by dark areas based on FDG-PET imaging

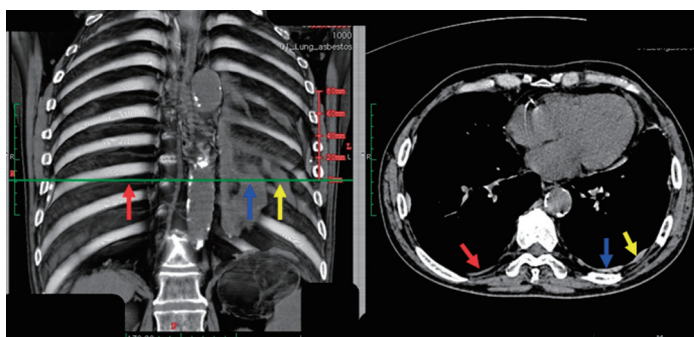


Fig. 27. Image of pleural plaque and intercostal veins using 3D CT (left) Image taken using conventional CT image (right)

of the chest (Fig. 27 right side), although pleural plaque (yellow and blue arrows) and intercostals veins (red arrow) are indicated in the same way in the images, if we generate a new image using the 3D imaging method (Fig. 27 left side), the images are totally different and differential diagnosis becomes easy.

Coniotic nodule and lung cancer differential diagnosis method based on PET

If FDG-PET is used, we clarified that for pneumoconiosis complicated by lung cancer, coniotic nodules are relatively darker than other areas (Fig. 28). By using FDG-PET, we were able to clarify that for pneumoconiosis complicated by lung cancer coniotic nodules are relatively darker than other areas (Fig. 28).

References:

- 1) Kimura K.: Research, development, and dissemination of a model diagnosis method for pneumoconiosis complicated by lung cancer, Research report. The Japan Labour Health and Welfare Organization, Clinical Research Center for Occupational Respiratory Diseases, 2008.
- 2) The Japan Labour Health and Welfare Organization: Compilation of image based examinations of pneumoconiosis cases according to current occupations. The Japan Labour Health and Welfare Organization, 2007.
- 3) The Japan Labour Health and Welfare Organization: Compilation of image based examinations of current pneumoconiosis cases. The Japan Labour Health and Welfare Organization, 2008.
- 4) Honda H.: Development of a new image-based diagnosis method that improves the diagnostic accuracy. – 1. Ground-breaking 3D CT imaging method for pleural plaque. 2. Diagnostic method for pneumoconiosis complicated by lung cancer based on temporal subtraction technique. The Japan Labour Health and Welfare Organization, Clinical Research Center for Occupational Respiratory Diseases, 2007.
- 5) The Japan Labour Health and Welfare Organization: New image based diagnostic method: Temporal subtraction technique. The Japan Labour Health and Welfare Organization, 2008.
- 6) Kimura K., Nakano I., Usami I., Onishi K., Kishimoto T., Gemba K., Mizuhashi K., Takagi M., and Kaji H.: An investigation on the usefulness of temporal subtraction technique to detect lung cancer in pneumoconiosis. Japanese Journal of Occupational Medicine and Traumatology, 56:179-186, 2008.
- 7) Honda H., Kimura K., Awaka M., Takagi M., and Kaji H.: A trial of the 3D display of the pleural plaque re-constructed by the CT images. Special publication. Japanese Journal of Occupational Medicine and Traumatology, 55:49-54, 2007.
- 8) The Japan Labour Health and Welfare Organization: New image-based diagnostic method for pleural plaque using 3D chest images. The Japan Labour Health and Welfare Organization, 2008.
- 9) The Japan Labour Health and Welfare Organization: New image-based diagnostic method: Research on pneumoconiosis based on FDG and MET-PET. The Japan Labour Health and Welfare Organization, 2008.
- 10) Kanegae K., Nakano I., Kimura K., Kaji H., Kuge Y., Shiga T., Zhao S., Okamoto S., and Tamaki N.: Comparison of MET-PET and FDG-PET for differentiation between benign lesion and lung cancer in pneumoconiosis, Ann Nucl Med 21: 331-337, 2007.

* Reference 1 can be viewed at <http://www.research12.jp/h13/index.html>, a site dedicated to the research and development, and dissemination projects related to the 13 fields of occupational injuries and illnesses.

* References 3, 5, 8, and 9 can be viewed at <http://www.research12.jp/h13/index.html>, a site dedicated to the research and development, and dissemination projects related to the 13 fields of occupational injuries and illnesses.