Session 1 General Nuclear Medicine

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Magnification Bone Scintigraphy: Present Status and Prospect

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Since the first publication of bone scanning in 1961 by Fleming et al, the scope of bone scanning has continuously been expanded, and it has now become one of the most widely used nuclear scans. The successive addition of nuclear angiography, SPECT and pinhole magnification has greatly enhanced the diagnostic feasibility.

In particular, pinhole scintigraphy can provide unique information regarding both the anatomy and metabolism or molecular alterations of a variety of skeletal disease. Technically, it is to be noted that pinhole imaging is only means to truly improve the resolution. Simulated magnification techniques or SPECT cannot improve the resolution. SPECT is designed to primarily eliminate overlapping anatomy by sectioning. With the modification of scan technique by using ^{99m}Tc-hydroxydiphosphonate (HDP) and 4-mm pinhole, most planar bone pinhole scintigraphy can be completed within 15-20 min.

Recently, dual-head planar pinhole scintigraphy and pinhole SPECT have been developed. The former mode can yield a pair of high-resolution scans eliminating the blind zone and the latter mode, the hybrid of pinhole magnification and tomography, can portray anatomy and pathology in an amazing detail. Supported by the future development of new hard and soft wares, and applied to small anatomical structures and subtle pathology, these scintigraphic modes are expected to open a new horizon in the diagnosis of musculoskeletal diseases.

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The Measurement of Tracheo-Bronchial Mucociliary Clearance with ^{99m}Tc-DTPA Aerosol Scintigraphy and its Preliminary Application in COPD Patients

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Objectives: Mucocoiliary clearance of respiratory channels is one of the important mechanisms guarding against retention of foreign particles within the lungs. Disorders of the mucociliary transport system play a major role among non-respiratory function in causing congenital and acquired bronchial disease. Thus, objective assay of the system is essential to recognizing and understanding abnormalities. In the present paper, a simple, noninvasive, and reliable in vivo method of monitoring mucociliary clearance function is reported. **Methods:** 18 healthy subjects and 32 COPD patients were studied with ^{99m}Tc-DTPA aerosol scintigraphy. Monitoring was performed by visual inspection (cinescintigraphy, to observe the distribution of ^{99m}Tc-DTPA particles and the movement of radiomucous "hot bolus") and quantitative analysis (two indexes were utilized: the first is airway clearance ratio (ACR); the second is mucociliary clearance rate (MCC), i.e. speed of advances of mucous bolus, calculated according to the formula reported by Zwas). **Acquisition condition:** Siemens 3700 SPECT, 64×64 byte mode, zoom 2. Sequential images (frame/60s) were obtained for 120 minutes. **Results:** The deposition pattern of ^{99m}Tc-DTPA particles in normal subjects was uniform. The deposition pattern in COPD patients demonstrated in general a centrally located distribution with major retention in the proximal airways. Four abnormal mucous transport patterns were regionally observed: stasis, regurgitation, straying and spiral or zigzag transport. Statistical analysis showed there was a significant difference of ACR between healthy subjects and COPD patients at different time points ($P<0.05$). The MCC in healthy subjects and COPD patients was 3.89 ± 0.92 mm/min and 1.32 ± 0.59 mm/min respectively. **Conclusion:** The method of assaying tracheo-bronchial mucociliary clearance reported here is simple and objective. It has not only the advantage of visual inspection and quantitative analysis, but also has a potential usefulness in studying other bronchial diseases and evaluating of therapeutic effectiveness of drugs.