

Summary

Registration of Chest PET and CT Images —Fusion Technique Using the PET/Tr Image by the Respiration Compensation—

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[Objective] The conventional registration of PET images of the chest with CT images is performed by rotating and shifting those images while used median lines and contours on axial images as the reference indexes. For the thoracic and the abdominal regions, therefore, the respiratory movements have prevented us from achieving satisfactory levels of registration reproducibility and accuracy. In order to solve this, we have analyzed respiratory movements of the chest and derived an image fusion method.

[Methods] Respiratory movements of the lung along each axis (X-axis: left-right, Y-axis: dorsoventral, and Z-axis: craniocaudal) during deep breathing were analyzed using CT-3D images. In addition, respiratory movements of the lung and thorax in the Y-axis and Z-axis directions during deep breathing and at rest were also analyzed by using an MR system that is the non-invasive method and allows for acquiring arbitrary tomographic images. Respiratory movements were compensated for on PET images of the lung. Moving average deviations in the Y-axis and Z-axis directions, which were obtained from the analytical result of respiration (30 samples), were used to

derive the compensatory values.

[Results] The analysis of CT-3D images showed that the movements in the X-axis direction were negligible. Registration of PET images with CT images was found useful when it performed on the sagittal planes. The analysis of MR images on sagittal planes revealed that the region extending from the apex of the lung to the posterior wall of the lung was useful for reference indexes for registration. The PET image by the compensation of the respiration transfer difference in the pulmonary hilum division was fusion on the CT image. In the pulmonary hilum division, the improvement in the accuracy of 3.6 mm in the dorsoventral and 6.1 mm in the craniocaudal direction was obtained in comparison with the fusion only of the reference index.

[Conclusion] The developed image fusion technique compensating the respiratory movements was found to be effective over the region of the hilum of the lung than the conventional technique.

Key words: PET image fusion of chest, Compensation for respiratory movements, Sagittal plane, Reference index for registration.