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A Practical Fusion Method for Anatomic Location of Metabolically Changed Lesions

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Purpose: PET has the advantage of early diagnosing metabolically changed lesions, especially for localization of epileptic foci and tumor. However, PET images are not so good to demonstrate anatomic structures as CT and MRI. In order to accurately define the anatomic location of metabolically changed lesions, we explored a fusion method to match the slices of PET volume images with the patients' CT/MRI film images. **Materials and Methods:** 22 epilepsy patients and 53 patients with tumors or in suspicion of cancer were involved in this study. PET images were acquired 30-60 minutes after injection of F-18 FDG with an ECAT EXACT HR+ system. The CT/MRI images were obtained with a photo scanner form the patients' report films of recent (generally within two weeks) examinations, and then saved in BMP format and transferred to the PET's workstation with a floppy. Using a software called "Multi-Purpose Image Tool (MPItool)", the images were compared, matched and analyzed in a SUN micro-workstation, which was also used to control process of PET images. **Results**: By adjusting the size and axial of the volume images of PET, and with the tools such as contour, ruler and magic adjuster, slices of PET images were aligned, coregistered and matched with the CT/MRI images. Knowledge about homologous anatomic structures between PET and CT/MRI was very important for image co-registration. Generally, 3 or more anatomic markers or contours were used to fit two images. By the fusion method, 29 epileptic foci were accurately localized on 21 patients' MRI images, while MRI alone had only 6 true positive findings. The other 8 lesions on MRI or CT were ruled out of the possibility of seizure foci. In 53 cancer or suspicious cancer patients, 53 lesions were considered as positive in which 10 lesions were ignored and not mentioned by CT/MRI reporters. All lesions were localized in the patients' CT/MRI images. On the other hand, 23 CT/MRI lesions showed negative or with low uptake in the PET images, and were finally proved to be benign by surgery or follow up. **Conclusion:** With the MPItool software, a method were developed to match the slices of volume images of PET with the patients' CT/MRI film images obtained with a photo scanner. The fusion method was relatively easy to manipulate, and was very useful in localization of metabolically changed lesions in clinical practice, especially for those for those without anatomic changes, or uneasy to be detected on CT/MRI.