

Comparison of the accuracy in kidney activity concentration estimates by the conjugate view and posterior view methods

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Purpose: In nuclear medicine the conjugate view method (CV) is the most common method for activity quantifications in planar images. The advantage with the CV method is its depth independence, i.e. the activity concentrations can be calculated from two opposite planar images without the knowledge of depth. However, one disadvantage of the method that the signal to background ratio is dependent on the location of the object. This effect might increase the inaccuracy in the activity concentration estimates. Therefore, the activity in off-center objects might be better estimated by the camera projection with the shortest camera to object distance. The aim of the present study was to compare the CV method with a posterior-anterior (PA) projection method for estimation of ¹⁷⁷Lu activity concentrations in the kidneys.

Methods: The two methods were used to retrospectively determine and compare the left and right kidney activity concentration in 20 patients treated with ¹⁷⁷Lu-DOTA-octreotate at Sahlgrenska University Hospital. The kidney was segmented in the SPECT or CT image using an appropriate segmentation algorithm. An attenuation map for ¹⁷⁷Lu was created from the CT. Attenuated planar AP and PA projections were created from the SPECT and the attenuation map. The kidney VOI was projected onto the AP and PA projections. The activity concentration in the kidney was calculated using both the PA projection method (AC_{PA}) and the CV method (AC_{CV}) and the results were compared to the concentration in the kidney VOI in the SPECT.

Results: The mean ratio between AC_{CV} and the SPECT determined activity concentration was 1.99 with a standard deviation (SD) equal to 1.03 and the mean ratio between AC_{PA} and the SPECT determined concentration was 1.66 with SD=0.80. Both methods demonstrated that the main problems with activity estimates from planar images are the influences of attenuation and the activity concentration in the under and overlying tissues.

Conclusions: The present study shows that a true background estimate cannot be accurately performed with neither the CV nor the PA method and that the difficulties in obtaining a true background affect the CV method more than the PA method. The study indicates that the PA method gives a more accurate estimate of the kidney activity concentration than the CV method.