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AN OPTIMAL FREQUENCY CHARACTERISTIC OF NOISE REDUCTION FILTER FOR Tl-201 MYOCARDIAL SPECT. J. Tsukada, K. Machida, N. Honda, T. Takishima, T. Maeda, K. Kaizu, and M. Hosoba, Saitama Medical Center, Saitama Medical School, and Shimadzu Corp.

Since projection data of Tl-201 myocardial SPECT contain a significant quantity of noise, it is desirable to decrease noise by an appropriate filter before reconstructing transverse images. The purpose of our study is to determine an optimal filter frequency characteristic for myocardial SPECT. Thirty-two projection data were collected from Tl-201 filled myocardial phantom by 180 degree rotation of a gamma camera (ZLC 7500). The data were processed by 27 Butterworth-Wiener filters of different characteristics, and SPECT images were reconstructed from each set of the filtered data by Shepp-Logan filtered back projection method. Optimal filtering was determined by detectability of defects in the phantom. Optimal parameters of filter characteristic is : 1) cutoff = 0.25/pixel(0.125/cm), 2) FWHM = 2 pixels (1 cm), 3) noise/signal(N/S) ratio = 0.02. Cutoff frequency affected the detectability of defects most, while FWHM and N/S ratio affected less.

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Non-uniform attenuation correction method for SPECT of the heart. H.Toyama, M.Hosoba, H.Wani, H.Murata, E.Tanaka and H.Murayama. Inst. Clin. Med. Tsukuba Univ.,Ibaragi, Shimazu Company, Kyoto, Toranomon Hospital, Tokyo and NIRS Chiba.

Attenuation correction is usually performed with assumption that the object is uniform attenuater. In the case of cardiac study, however, this assumption is broken due to including the lung with small attenuation coefficient. Non-uniform attenuation correction method was developed for clinical use using with radial post correction (RPC) algorithm. In RPC method, normalized projection, which called center projection, to the center of heart was generated from the projection data.Non-uniformity in attenuater was taken into consideration by multiplying the center projection by the correction function, which is calculated from the simulation data with iterated RPC(IRPC). Because of selecting the center of the heart,the correction function is supposed to be used commonly. In computer simulation study, non-uniform attenuation correction with IRPC was sucessful in using the common correction function. In clinical use, there were some cases to improve the image at the inferior and posterior position. In some cases, however, artifacts due to our correction were generated. This correction method would be powerful for clinical use, because of saving the computation time and omitting the measurement of transmission data.

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EXPERIMENTAL CONSIDERATION OF MYOCARDIAL QUATITATIVE SPECT IMAGE. K.Ogawa,E.Kunieda, J.Sakurada,S.Shimizu,A.Kubo and S.Hashimoto School of Medicine, Keio University, Tokyo.

We studied the quantity of Thallium myocardial SPECT image with a cardiac phantom. The myocardial SPECT image is influenced by several causes, i.e., the absorption of gamma rays, collimator aperture, statistical noise and limited angle of rotation in data acquisition.
(1) The attenuation correction under the assumption of uniform distribution is not sufficient. The effects of the nonuniform attenuation are most prominently appeared when we evaluate the quantity by the integral method. (2) The aperture characteristics of a collimator are decided by the distance between the rotational center of the gamma camera and the collimator surface. Simultaneously scattered gamma rays affect the reconstructed image in the low frequency component, so the effective attenuation coefficient varies gradually.
(3) The statistical noise generate artifacts like as lump-shaped pattern. The noise are clearly appeared in the spatial frequency upper than 0.25 cycle, so the low-pass filter are required with that of cut-off frequency. Moreover to enhance the details of the distribution of cardiac muscle, the Winer filter should be applied.
(4) The scan area also affects the appearance of the artifact in the myocardial SPECT image. The 360 degrees scan should be used from the standpoint of reconstructing more quantitative image.

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IMPROVEMENT IN THE ACCURACY OF SPECT TL-201 MYOCARDIAL IMAGING BY CORRECTING FOR PATIENT MOTION. RL.Eisner(1;2), AL.Chruchwell(1;2),J.Oates(1),T.Noever(2), DJ.Nowak(3),KG.Cloninger(1;2),D.Dunn(1), H.Carlson(1),J.Jones(1),DC.Morris(1), HA.Liberman(1) and RE.Patterson(1;2)
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Computer programs were developed to quantitate motion between consecutive frames of a Tl-201 SPECT study, simulate non-returning vertical motion in a normal patients, and correct the acquired data for motion. Motion as small as 0.5-1.0 pixel in the vertical (axial) direction caused artifactual defects in the quantitive Bullseye display which resulted in a false-positive rate of up to 40% for a +1.0 pixel shift. Patient motion of magnitude greater then the threshold value for artifact-production (0.5 pixel), occurred at a rate of 10%, and should be corrected before SPECT reconstruction.