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重建算法对SPECT空间分辨力的影响

Impact of reconstruction algorithm on spatial resolution of SPECT

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中文摘要:

目的 探讨重建算法对SPECT断层成像分辨力的影响。方法 采用Siemens Symbia T SPECT机，对长轴分布5条线源的椭圆柱分辨力模型进行成像。选择Hann和Butterworth 2种滤波反投影法（FBP），每种窗函数各选择3种截止频率；Flash 3D和有序子集最大期望值（OSEM）法2种迭代法，各选择5种平滑函数；分别对图像进行断层重建。以线源半高宽（FWHM）代表重建图像的分辨力，计算5条线源6个层面上的径向、切向和轴向FWHM，并行多元线性回归分析。结果 FBP重建中，FWHM随窗函数截止频率增大而变小；同一截止频率下，Butterworth重建图像的FWHM小于Hann。迭代法中，FWHM随平滑函数核宽度增大而变大；Flash 3D和OSEM法重建图像径向及切向FWHM差异无统计学意义，而轴向Flash 3D图像的FWHM显著小于OSEM。结论 重建算法及参数设定对断层图像分辨力的影响较大，应根据临床需要和经验适当选择。

英文摘要:

Objective To investigate the impact of reconstruction algorithm on spatial resolution of SPECT. **Methods** Imaging of an cylinder resolution phantom was performed using Siemens Symbia T SPECT equipment with parallel hole low-energy high-resolution collimator. In long axis direction of the resolution model, there were 5 parallel line sources. The acquisition condition was contour with step and shoot mode. All acquisitions were reconstructed using both filtered back projection (FBP) and iterative method, including Hann and Butterworth in three cutoff frequencies, Flash 3D and ordered subsets expectation maximization (OSEM) 2D in five Gaussian kernel function widths. The reconstructed images with different algorithms and parameters were analyzed. The resolution of line resolution spread function was evaluated by full width at half maximum (FWHM) value. Then FWHM values of 5 line sources in 6 different sections were calculated tangentially, radially and axially. Statistical method of multiple linear regression was used to analyze the impact of different reconstruction algorithms and parameters. **Results** FWHM values for FBP reduced with the cutoff frequencies increased, the higher the cutoff, the better the resolution. In the same cut-off frequency, FWHM of Butterworth was smaller than that of Hann, and statistical differences were found between the two methods. In iterative method FWHM increased when Gaussian kernel function widths increased. No statistical difference of FWHM between Flash 3D and OSEM algorithm in radial and tangential resolution, whereas axial FWHM of Flash 3D was statistically smaller than that of OSEM algorithm. **Conclusion** Reconstruction algorithm has great impact on spatial resolution of SPECT. The algorithm and parameters should be appropriately selected for clinical practice.

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