FBP、ASiR和VEO三种重建算法对常规剂量胸部CT图像质量的影响

Impact of reconstruction techniques on routine dose chest CT image quality: Comparison of FBP, ASiR and VEO

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中文摘要：

　　目的　探讨滤波反投影(FBP)、自适应统计迭代重建技术(ASiR)和基于模型的迭代重建算法(MBIR,商品名"VEO")三种重建技术对常规剂量胸部薄层CT图像质量的影响。方法　应用能谱CT对15例成年患者行胸部增强CT扫描,扫描条件:100 kVp,自动毫安,噪声指数15,螺距0.984：1,球管转速0.4秒/圈。分别用FBP、50%ASiR(50%比例ASiR和FBP混合以降低噪声)和VEO三种重建算法对原始数据行0.625 mm薄层重建,测量图像噪声及胸主动脉与背部肌肉的对比噪声比(CNR),并对3组图像分别进行质量评分,然后行对比分析。结果　FBP、50%ASiR和VEO三组图像的噪声分别为24.30±3.55、17.11±2.55及11.69±1.74,50%ASiR和VEO组图像噪声分别较FBP组降低29.59%和51.89%(P均<0.01);胸主动脉与背部肌肉的CNR FBP、50%ASiR和VEO三组图像分别为10.56±3.05、15.15±3.88及21.69±5.62,50%ASiR和VEO组图像CNR较FBP组分别提高43.47%和105.40%(P均<0.01);图像质量主观评分FBP、50%ASiR和VEO三组图像分别为4.03±0.72、4.63±0.41及5.75±0.25,50%ASiR和VEO组图像较FBP组分别提高14.89%和42.68%(P均<0.01)。结论　与FBP重建算法比较,在相同剂量条件下,50%ASiR和VEO能显著降低胸部CT图像噪声并提高图像质量;其中VEO重建算法降噪及提高图像质量效果更为显著。

英文摘要：

　　Objective To investigate the impact of different reconstruction algorithms, including filtered back projection (FBP), adaptive statistical iterative reconstruction (ASiR) and model-based iterative reconstruction (MBIR, with VEO as its trade name) on image quality of the routine dose chest CT. **Methods** With institutional review board approval, 15 adult patients who underwent enhanced chest CT examination were enrolled. Scanning parameters included a pitch of 0.984：1, 100 kVp (peak), noise index 15, auto current, 40 mm table feed per rotation. Raw data were reconstructed with FBP, 50% ASiR (blending of 50% ASiR and 50% FBP for obtaining noise reduction) and VEO algorithm respectively, and the reconstructed section thickness was 0.625 mm. Image noises were measured, and contrast-to-noise ratio (CNR) of thoracic aorta relative to back muscle was assessed. Image quality was assessed using a 6-point scale. **Results** The image noise of FBP, 50%ASIR and VEO was 24.30 ± 3.55, 17.11 ± 2.55 and 11.69 ± 1.74, respectively. Compared with FBP, objective image noise reduced by 51.89% ($P<0.01$) and 29.59% ($P<0.01$) in images reconstructed with VEO and 50%ASiR, respectively. The CNR of thoracic aorta to back muscle for FBP, 50%ASiR and VEO was 10.56 ± 3.05, 15.15 ± 3.88 and 21.69 ± 5.62, respectively. Compared with FBP, CNR of images reconstructed with 50%ASiR and VEO increased by 43.47% ($P<0.01$) and 105.40% ($P<0.01$), respectively. The mean subjective score of image quality reconstructed with VEO was 5.75 ± 0.25, 14.89% and 42.68% higher than that of FBP (4.03 ± 0.72, $P<0.01$) and 50%ASiR (4.63 ± 0.41, $P<0.01$). **Conclusion** VEO and ASIR reconstruction techniques have the ability to reduce image noise and improve image quality compared with the current algorithms such as FBP, especially VEO technique.

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