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Title: Effect of different tube voltage and noise index on radiation dose of different body thickness in phantom using tube current automatic regulation technology

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关键词: 自动管电流调制技术; 噪声指数; 体厚; 管电压; 辐射剂量

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摘要: 目的 探讨使用自动管电流调制技术下,不同管电压、噪声指数选择对体模不同体厚辐射剂量的影响。 方法 使用自制锥形体模,进行分段扫描,以实现对不同体厚患者的模拟,利用自动管电流调制技术,分别调整噪声指数(noise index,NI) (10~20)及管电压(80~140 kV),记录容积CT剂量指数(volume computed tomography dose index,CTDIvol)。 结果 平均体厚<126.2 mm,噪声指数10~12,管电压80 kV,CTDIvol最低,噪声指数12~20,管电压使用120 kV,CTDIvol最低,平均体厚≥126.2 mm,噪声指数在10~20,管电压使用120 kV,CTDIvol最低;并建立回归方程:CTDIvol=0.511+0.081×厚度-0.709×噪声指数+0.004×电压,对总体模型、厚度系数及噪声指数系数进行检验,P值均<0.001,对截距及电压系数进行统计学检验,P值分别为0.487、0.415。 结论 使用自动管电流调制技术,辐射剂量(CTDIvol)随扫描厚度的增加而增加,随噪声指数的增加而降低,与管电压没有明显相关性,但通过数据观察,在成人厚度范围,使用管电压120 kV,能够实现辐射剂量的降低。

Abstract: Objective To evaluate the effect of different tube voltage and noise index on radiation dose of different body thickness in phantom using tube current automatic regulation technology. Methods Home-made cone phantom

was used for segmental scanning in order to simulate patients with different body thickness. Using tube current automatic regulation technology, the noise index (10-20) and tube voltage (80-140 kV) were adjusted, respectively, and volume computed tomography dose index (CTDIvol) was recorded. Results When the average body thickness was less than 126.2 mm, CTDIvol was the lowest either the noise index was 10-12 and tube voltage was 80 kV or the noise index was 12-20 and tube voltage was 120 kV. When the average body thickness was not less than 126.2 mm, CTDIvol was the lowest if the noise index was 10-20 and tube voltage was 120 kV. The regression equation was established:  $CTDIvol = 0.511 + 0.081 \text{ thickness} - 0.709 (\text{noise index}) + 0.004 \text{ voltage}$ . The coefficients of overall model, body thickness and noise index were all tested ( $P < 0.001$ ), and the coefficients of distance and voltage were also analyzed ( $P = 0.487, 0.415$ ). Conclusion Using tube current automatic regulation technology, the radiation dose (CTDIvol) increases with the increase of the phantom thickness, and decreases with the increase of the noise index. Although there is no significant correlation between CTDIvol and tube voltage, the radiation dose can be reduced by using tube voltage of 120 kV within the range of adult body thickness.

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