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旋转DSA影像变形程度及测量误差的实验研究

Experimental study of rotational DSA on image deformation and measurement error

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中文摘要:

目的 通过模型实验评价旋转DSA的影像变形情况和测量误差。方法 取5个直径20 mm钢球,横向间隔30 mm排列,将中心位置钢球置于等中心点进行旋转DSA采集。再取5个直径10 mm钢球,与上述钢球纵向间隔30 mm并以相同方式排列,进行相同的旋转DSA采集。将显示屏分为5个区域,观察各个旋转角度钢球二维影像的形态变化。选择两组实验图像中的左前斜20°、40°、60°钢球影像,分别用自动等中心校准法和球体校准法测量,与钢球实际直径比较,计算影像的放大率。结果 除中央区的钢球以外,其他区域钢球在不同旋转角度的二维影像均产生了变形,随钢球距离探测器的远近产生影像放大或缩小。采用自动等中心校准法测量时,仅中央区钢球与实际直径大小相同,钢球离中央区越远或旋转角度越大,测量误差越大(最大放大率12.42%)。采用球体校准对各个区域钢球在不同旋转角度时的测量结果基本一致,测量误差较小(最大放大率3.41%)。结论 旋转DSA成像时,将病变定位于中央区可减小二维影像变形。根据病变的位置合理选择测量技术有助于降低测量误差。

英文摘要:

Objective To evaluate the image deformation and measurement error of rotational DSA by model experiment. **Methods** Five steel balls (diameter: 20 mm) were placed in a horizontal space of 30 mm, the middle of which was as the isocenter for rotational DSA acquisition. Another 5 steel balls (diameter: 10 mm) were placed in a vertical space of 30 mm with the same alignment for rotational DSA acquisition. The screen was divided into five regions and the morphological changes of the ball image were observed at each rotation angle. The experimental images of the left anterior oblique ball images at 20°, 40° and 60° among each two groups were selected and measured by automatic isocenter calibration and sphere calibration respectively, and compared with the actual diameters of balls to calculate the image magnification. **Results** Except the center one, other balls were of deformation at different rotation angles due to the distance to the detector leading to enlargement and reduction. With automatic isocenter calibration, only the diameter of the center ball corresponded with the actual one, the distance away from the center or the rotation angle was inversely proportional to measurement error (maximum magnification 12.42%).With sphere calibration, the measurement results in various regions at different rotation angle were basically the same, with smaller measurement error (maximum magnification 3.41%). **Conclusion** Placing the organ of interest in the center area can reduce image distortion in rotational DSA imaging. Selecting reasonable measuring technology according to the lesion location is helpful to control measurement errors.

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