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探讨能谱CT宝石能谱成像技术用于骨密度测量的可行性

Feasibility of bone density measurement based on CT gemstone spectral imaging

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中文摘要：

　　目的 利用能谱CT宝石能谱成像技术(GSI)定量测定健康成年女性L2骨质钙含量,评估能谱CT对骨密度(BMD)测量方法的可行性及准确性。方法 选取接受上腹部CT能谱GSI扫描的健康女性271名为研究组,均无手术、肿瘤病史及其他影响BMD的疾病,年龄18~89岁,按年龄分为<30岁、30~39岁、40~49岁、50~59岁、60~69岁、70~79岁及≥80岁组。将扫描信息传至GSI浏览器进行基物质成像分析。选L2椎体中间层面测量3个ROI的钙质含量,取均值。对照组:筛选213例患者行双能X线吸收法BMD仪(DEXA)测量,选择标准和年龄段分组同上,选取L2椎体后前位测量面密度。采用方差分析对研究组中各年龄组的测量结果进行比较。对年龄与能谱钙(水)密度、各年龄段L2椎体平均钙(水)密度与DEXA的BMD均行$Pearson$相关性分析。结果 能谱CT基物质成像技术与DEXA法测量结果具有相关性($r=0.835,P<0.05$);30~39岁组BMD最高;≤39岁者年龄与钙(水)密度呈正相关;>40岁者年龄与钙(水)密度呈负相关。结论 能谱CT基物质成像技术可作为测量骨质中钙(水)密度的新方法,其测量结果与DEXA测量结果相一致,均与年龄相关。

英文摘要：

　　Objective To measure calcium concentration at L2 of normal females with CT gemstone spectral imaging (GSI), and to evaluate the feasibility and accuracy of spectral CT in measurement of bone mineral density (BMD). **Methods** Totally 271 women without trauma, surgery, tumor or other diseases that affecting BMD (aged from 18 to 89 year-old) were included and underwent upper abdominal GSI examination with spectral CT. The females were divided into 7 groups according to the age, i.e.<30, 30-39, 40-49, 50-59, 60-69, 70-79 and ≥80 group. All data were transmitted to GSI browser and reconstructed for quantitative image analysis. Calcium concentration was measured with ROI at central level of L2 for 3 times, and the mean value was obtained. Meanwhile 213 females who underwent dual energy X-ray absorption (DEXA) examination were selected as the controls with same criteria and group division, and then BMD was measured at L2. $Pearson$ correlation analysis was done between the two groups. **Results** The results measured with GSI examination and DEXA had correlation ($r=0.835$, $P<0.05$). Females aged 30-39 had the highest Calcium (water) concentration and BMD. Calcium concentration and BMD showed positive relationship to age in females ≤39 years and negative relationship in >40 years. **Conclusion** GSI is a new and easy method in measuring calcium (water) concentration. The calcium (water)-based images of spectral CT can reflect BMD as in DEXA, and both methods show same relation with age.

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