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## 封面文章

非对称回波的最小二乘估算算法迭代 (iterative decomposition of water and fat with echo asymmetrical and least-squares estimation quantitation sequence, IDEAL-IQ) 水脂分离方法是一种三点式 Dixon 法的新型磁共振水脂分离技术, 利用优化回波位移和梯度回波成像, 能准确量化脂肪分数和铁质沉积, 临床上多应用于定量判断肝脏及骨骼肌的脂肪沉积。

随着精准定量医学影像技术的快速发展、图像识别技术和数据算法的不断更新, 医学影像大数据的挖掘和分析得以实现, 影像组学应运而生。通过从影像图像中高通量地提取并分析大量高级且定量的影像学特征, 来实现精准定量、分子靶向成像和疗效评估的目的。

慢性下腰痛患者椎旁肌肉常伴有不同程度的脂肪浸润, 主要表现为肌肉的脂肪浸润及萎缩。本研究基于 IDEAL-IQ 序列 MR 纹理分析评价椎旁肌肉脂肪浸润的可行性, 提取腰大肌 (psoas major)、竖脊肌 (erector spinae) 及多裂肌 (multifidus muscle) 脂肪分数 (fat fraction, FF) 值、横截面积 (cross sectional area, CSA) 值和纹理特征参数, 同时基于 T2WI 序列行 Goutallier 脂肪浸润程度分级, 采用单因素方差分析对椎旁肌肉 Goutallier 分级组间 FF 值及 CSA 值的差异性进行比较, 采用 Spearman 秩相关检验评价椎旁肌肉 Goutallier 分级与 FF 值及 CSA 值的相关性, 通过 ROC 曲线评估纹理分析参数的诊断效能, 并采用 Spearman 秩相关检验分析纹理参数特征值与 FF 值的相关性, 结果显示慢性下腰痛患者腰椎旁腰大肌、竖脊肌、多裂肌的 Goutallier 分级与 FF 值及 CSA 值均存在相关性, 而且基于 IDEAL-IQ 序列脂肪分数图的纹理分析评价椎旁脂肪浸润是可行的。详见内文第 6~11 页。

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#### About the cover

IDEAL-IQ refers to iterative decomposition of water and fat with echo asymmetrical and least-squares estimation quantitation sequence. As a cutting-edge MRI technique, it can separate fat and water using the three-point Dixon method, which can accurately quantify fat fraction and iron deposition by optimizing echo displacement and gradient echo imaging. It is widely used in clinical quantitative judgment of fat deposition in the liver and musculoskeletal system.

With the rapid development of accurate and quantitative medical imaging technology and the continuous updating of image recognition technology and data algorithms, the mining and analysis of medical image big data can be realized, the radiomics come into being. Through high-throughput extraction and analysis of a large number of advanced and quantitative imaging features from raster images, accurate quantitative, molecularly targeted imaging and efficacy evaluation can be achieved.

Paravertebral muscles in patients with chronic low back pain are often accompanied by varying degrees of fat infiltration, which is mainly manifested as fat infiltration and atrophy of muscles. Our study investigated the feasibility of MR texture analysis in evaluating paravertebral muscle fat infiltration based on IDEAL-IQ sequence. Fat fraction (FF) value, cross-sectional area (CSA) value and texture characteristic parameters were extracted from psoas major (PS), erector spinal muscle (ES) and multifidus muscle (MF), and paraspinal muscles were graded by T2WI-based Goutallier classification. Between Goutallier classification groups, the difference of FF and CSA in paravertebral muscles is compared by one-way analysis of variance, the relevance of the classification of Goutallier with FF and CSA was evaluated by adopting the analytic method of Spearman correlation, the evaluation of the diagnostic efficacy of texture analysis parameter was processed by receiver operating characteristic curve (ROC), with FF value and the parameters of texture features being analysed by the relevance of Spearman. The results showed that the Goutallier grades of lumbar paravertebral PS, ES and MF in patients with chronic low back pain were correlated with FF and CSA, and it was feasible to evaluate paravertebral fat infiltration by texture analysis based on IDEAL-IQ sequence fat fraction image. See text page 6-11.