磁共振成像

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目　次

封面文章

前列腺癌（prostate cancer, PCa）是男性常见的恶性肿瘤之一，其发病率和死亡率在全球范围内呈持续上升趋势。神经侵犯（perineural invasion, PNI）是反映PCa侵袭性的关键病理特征，与肿瘤局部进展、术后复发及患者预后密切相关。因此，术前识别PNI对于患者风险分层、神经保留手术决策及个体化治疗具有重要临床意义。然而，PNI的判定目前仍以术后组织病理学检查为主要依据，术前缺乏成熟的无创预测手段。

近年来，多参数磁共振成像凭借多序列成像优势，可从组织结构、扩散及微循环等方面刻画PCa的生物学特征。前列腺周围脂肪组织（periprostatic adipose tissue, PPAT）作为PCa肿瘤微环境的重要组成部分，其脂肪含量及相关定量影像特征已被证实与PCa分级及侵袭性存在密切关联。此外，基于胸部CT平扫的体成分分析（body composition analysis, BCA）可获取肌肉及脂肪组织分布信息，反映患者营养、代谢及全身状态，相关体成分异常与多种恶性肿瘤的侵袭性及不良预后密切相关。

现有影像学研究主要从局部肿瘤形态及组织特征评估PCa侵袭性，而全身肌肉脂肪组成、肿瘤周围脂肪微环境与临床状态之间的潜在关联尚未得到充分关注。本研究回顾性分析PCa患者术前胸部CT体成分指标、PCa病灶及PPAT多参数MRI定量参数和临床实验室指标，通过组间差异分析及多因素logistic回归筛选PNI独立预测因子，分别建立单一及联合预测模型，并采用ROC曲线评价各模型的预测效能，进一步构建联合预测模型，以探讨多模态影像及临床指标联合预测PCa PNI的价值，为PCa术前风险分层及个体化治疗决策提供依据。详见内文第25页。

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Contents

About the cover

Prostate cancer (PCa) is one of the most common malignancies in men, with its incidence and mortality continuing to increase worldwide. Perineural invasion (PNI) is a key pathological feature indicative of the invasive potential of PCa and is closely associated with local tumor progression, postoperative recurrence, and adverse clinical outcomes. Therefore, preoperative PNI identification is essential for risk stratification, nerve-sparing surgical planning, and individualized treatment. However, the diagnosis of PNI currently relies primarily on postoperative histopathological examination, and reliable noninvasive methods for its preoperative prediction remain limited.

In recent years, multiparametric magnetic resonance imaging (mpMRI) has shown considerable potential for characterizing PCa biological features by providing information on tissue structure, water diffusion, and microvascular perfusion. Periprostatic adipose tissue (PPAT), an important component of the tumor microenvironment of PCa, has been increasingly recognized as biologically relevant, with its fat content and quantitative imaging characteristics showing close associations with PCa grade and invasiveness. In addition, body composition analysis (BCA) based on non-contrast chest CT can provide quantitative information on the distribution of skeletal muscle and adipose tissue, thereby reflecting patients' nutritional, metabolic, and systemic status. Abnormalities in body composition have also been closely associated with tumor aggressiveness and adverse outcomes in various malignancies.

Previous imaging studies have primarily focused on local tumor morphology and tissue characteristics in the assessment of PCa aggressiveness, whereas the potential relationships among systemic muscle and adipose composition, the peritumoral adipose microenvironment, and clinical status have received comparatively limited attention. In this study, we retrospectively analyzed preoperative chest CT-derived body composition parameters, quantitative mpMRI parameters of PCa lesions and PPAT, and clinical laboratory indices in patients with PCa. Group comparisons and multivariable logistic regression analyses were performed to identify independent predictors of PNI. Subsequently, individual and combined predictive models were developed, and their predictive performance was evaluated using ROC curve analysis. The clinical value of integrating multimodal imaging and clinical parameters for the preoperative prediction of PNI in PCa was further investigated, with the aim of providing a noninvasive basis for preoperative risk stratification and individualized treatment decision-making in patients with PCa. Please see text page 25.

REVIEWS