磁共振成像

月刊
2010年1月创刊

2022年第13卷第2期
2022年2月20日出版

刊名题写：时任第十一届全国人大常委会副委员长韩启德

主　管　中华人民共和国国家卫生健康委员会

主　办
中国医院协会
首都医科大学附属北京天坛医院

国内发行　中国邮政集团有限公司北京市报刊发行局
邮发代号　2-855
国外总发行　中国国际图书贸易集团有限公司
国外发行代号　M 8958
印　刷　北京科信印刷有限公司

邮　购
磁共振成像编辑部
地址：北京市通州区玉带河东街358号4号楼3层，邮编：101100

电　话　010-67113815
E-mail　editor@cjmri.cn
网　址　www.chinesemri.com
定　价　每册30元　全年360元

中国标准连续出版物号
ISSN 1674-8034
CN 11-5902/R

广告发布登记证号　京西市监广登字20170242号

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乳腺癌是女性发病率第一的癌症。化疗是乳腺癌患者重要的治疗的手段，但是有8.1%～75%的患者出现与化疗相关的认知功能障碍，阐明化疗相关认知障碍的神经机制对其早期诊断和治疗至关重要。目前，关于化疗所致认知功能障碍的机制仍待研究。

功能磁共振(functional magnetic resonance imaging，fMRI)检查能探测细微的脑功能异常，是许多认知功能障碍疾病不可替代的检查工具。低频波幅(amplitude of low-frequency fluctuations，ALFF)被广泛应用于表征神经元自发活动的程度，具有较高的重测信度。此外，功能连接(functional connectivity，FC)分析可以探索脑同步性功能活动。

癌症患者在病程的各个阶段都存在认知功能障碍，而既往大多神经影像学研究的时间点为化疗结束后1个月，化疗导致的早期脑功能改变特点尚待研究。

本研究以完成新辅助化疗后第1周期的乳腺癌患者作为研究对象，采用ALFF和FC方法探讨化疗对脑功能活动的短期影响，分别在新辅助化疗前和行辅助化疗第1周期后进行静息态功能磁共振(resting-state functional MRI，rs-fMRI)扫描和神经心理测试。采用配对样本t检验进行纵向比较，并对rs-fMRI参数与神经心理测试评分进行相关性分析。结果发现，化疗后患者的右侧额中回、右侧岛叶及左侧背外侧额上回的ALFF值显著降低；左侧背外侧额上回与右侧额中回间的FC显著增高。这些发现提示化疗所致脑功能改变先于认知功能改变，并且化疗所致早期脑损害可能涉及执行功能以及情绪调控等相关脑区。详见内文第31～36页。

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本期支持单位：中国科学院分子影像重点实验室、首都医科大学附属北京潞河医院

CHINESE JOURNAL OF MAGNETIC RESONANCE IMAGING

ISSN 1674-8034, CN 11-5902/R, CODEN CCIHBW, Established in 2010 Monthly Vol. 13, No. 2, Feb 20, 2022

Tel & Fax 8610-67113815
E-mail editor@cjmri.cn
Website www.chinesemri.com
Price: USD 30.00

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About the cover

Breast cancer is the most prevalent cancer in women. Chemotherapy is an important treatment for breast cancer patients, but 8.1%-75% of patients have chemotherapy-related cognitive impairment. Clarifying the neural mechanism of chemotherapy-related cognitive impairment is essential for early diagnosis and treatment. At present, the mechanism of chemotherapy-related cognitive impairment needs to be explored.

Functional magnetic resonance imaging (fMRI) can detect subtle brain functional abnormalities. The amplitude of low-frequency fluctuations (ALFF) is widely used to characterize the degree of spontaneous activity of neurons, and has high test-retest reliability. In addition, functional connectivity (FC) analysis can explore brain synchronous functional activities.

Cognitive impairment exists in cancer patients at all stages of the course of disease, and the time point of most previous neuroimaging studies is one month after the end of chemotherapy. The characteristics of early brain function changes caused by chemotherapy remain to be studied.

The subjects of this study were breast cancer patients who received the first cycle of neoadjuvant chemotherapy. ALFF and seed-based FC analyses were used to explore the short-term effects of chemotherapy on brain functional activities. Resting-state functional MRI (rs-fMRI) scan and neuropsychological test were performed before neoadjuvant chemotherapy and after the first cycle of adjuvant chemotherapy respectively. Paired sample *t*-test was used for longitudinal comparison, and the correlation between rs-fMRI parameters and neuropsychological test scores was analyzed. The results showed that ALFF value of right middle frontal gyrus, right insula and left dorsolateral frontal gyrus were significantly decreased after chemotherapy. FC between left dorsolateral frontal gyrus and right middle frontal gyrus was significantly increased. These findings suggest that the changes in brain function induced by chemotherapy precede the changes in cognitive function, and that the early brain damage induced by chemotherapy may involve the brain regions related to executive function and emotion regulation. Please see pages 31-36.

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