磁共振成像

月刊
总第148期
2010年1月创刊

2024年第15卷第10期
2024年10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

发行范围　公开
发行单位　本刊发行部

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
印刷单位　北京科信印刷有限公司

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

国内统一连续出版物号
CN 11-5902/R
国际标准连续出版物号
ISSN 1674-8034

广告发布登记证号　京西市监广登字20170242号

目　次

封面文章

深度学习技术为未识别心肌梗死（unrecognized myocardial infarction, UMI）的早期诊断带来了全新的突破。UMI是一种无明显症状或典型表现的心肌损伤状态，在常规临床检查中容易被忽视，导致患者面临更高的长期风险。本研究旨在探索基于深度学习重建（deep learning reconstruction, DLR）的延迟强化图像对UMI患者的诊断价值。

本研究前瞻性纳入了2022年4月至2023年8月期间武汉大学人民医院就诊的98名可疑UMI患者，使用DLR算法对磁共振延迟钆增强（late gadolinium enhancement, LGE）图像进行优化，分析其在UMI诊断中的应用价值。研究分别获取了传统重建的LGE图像（original late gadolinium enhancement, LGE_O）和基于DLR获得的LGE图像（deep learning reconstruction-based late gadolinium enhancement, LGE_{DL}），并对两组图像的信噪比（signal-to-noise ratio, SNR）、对比噪声比（contrast-to-noise ratio, CNR），以及不同阈值法下的增强区域百分比（percentage of enhanced area, P_{area}）进行比较评估。

结果显示，LGE_{DL}图像在SNR和CNR方面显著优于LGE_O，DLR技术有效降低了图像噪声并提高了图像质量，增强了心肌病灶与周围正常组织的对比度。LGE_{DL}在不同阈值方法中的增强面积均高于LGE_O，4倍标准差（standard deviation, SD）阈值法在提高观察者间和观察者内一致性方面表现较好，而基于5SD的阈值法在检测UMI方面显示出最佳的诊断效能，受试者工作特征曲线下面积（area under the curve, AUC）为0.891。

此外，LGE_{DL}序列在观察者内和观察者间的一致性均优于LGE_O序列，显示出DLR技术在提高图像质量的同时，能够减少阅片者之间的差异，提高影像诊断的可靠性。通过提高图像质量和病灶的可视化，LGE_{DL}序列能够更加精准地量化UMI患者的梗死区域，为临床提供更可靠的个体化诊疗依据。

本研究表明，DLR技术在提高磁共振LGE图像的质量和诊断效能方面具有显著优势，尤其是在UMI的早期诊断中。基于DLR的LGE序列可以为临床医生提供更为精确和有效的影像诊断工具，有助于优化UMI患者的风险评估和治疗决策，从而改善患者的长期预后。详见内文第8页。

CHINESE JOURNAL OF MAGNETIC RESONANCE IMAGING

ISSN 1674-8034, CN 11-5902/R, CODEN CCIHBW, Established in 2010 Monthly Vol. 15, No. 10, Oct 20, 2024

Responsible Institution
National Health Commission of the People's Republic of China

Sponsor
Chinese Hospital Association
Beijing Tiantan Hospital of Capital Medical University

Publishing
Publishing House of Chinese Journal of Magnetic Resonance Imaging

General Distributor
Domestic: Beijing Newspaper and Periodical Distribution Bureau of China Post Group Co., Ltd.
Postal Code: 2-855
Overseas: China International Book Trade Group Co., Ltd., P.O. Box 399, Beijing, China
Code No.: M 8958

Mail Order
Third Floor, Building 4, No. 358, Yudaihe East Street, Tongzhou District, Beijing 101100, China

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

Contents

About the cover

Deep learning technology represents a significant advancement in the early diagnosis of unrecognized myocardial infarction (UMI). UMI is a condition with no obvious symptoms or typical manifestations of heart muscle damage that is easily overlooked during routine clinical examinations, leading to a higher long-term risk for patients. This study aims to explore the diagnostic value of delay-enhanced images based on deep learning reconstruction (DLR) for UMI patients.

In this prospective study, a total of 98 patients with suspected UMI who visited Renmin Hospital of Wuhan University between April 2022 and August 2023 were included. DLR algorithms were applied to optimize the reconstruction of late gadolinium enhancement (LGE) images obtained through magnetic resonance imaging (MRI), to assess their utility in UMI diagnosis. Original late gadolinium enhancement (LGE_O) and DLR-based LGE (LGE_{DL}) images were obtained and compared in terms of signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and the percentage of enhanced area (P_{area}) using different thresholding methods.

The results demonstrated that LGE_{DL} images had significantly superior SNR and CNR compared to LGE_O. DLR was effective in reducing image noise, enhancing image quality, and improving contrast between myocardial lesions and adjacent normal tissue. The enhanced areas in LGE_{DL} images were larger than those in LGE_O across different thresholding methods. The 4 times standard deviation (SD) thresholding method showed superior performance in terms of inter-observer and intra-observer consistency, while the 5SD thresholding method demonstrated the best diagnostic efficiency for detecting UMI, with an area under the receiver operating characteristic curve (AUC) of 0.891.

Additionally, the LGE_{DL} sequence exhibited better intra-observer and inter-observer consistency compared to the LGE_O sequence, indicating that DLR not only improves image quality but also reduces discrepancies among radiologists, thereby enhancing the reliability of imaging diagnoses. The enhanced image quality and visualization of myocardial lesions afforded by the LGE_{DL} sequence enable more accurate quantification of infarcted areas in UMI patients, thus supporting more reliable individualized clinical management.

This study demonstrates that DLR technology offers significant advantages in improving the quality and diagnostic performance of LGE images, particularly in the early diagnosis of UMI. LGE_{DL} can provide clinicians with a more precise and effective imaging diagnostic tool, aiding in the optimization of risk assessment and treatment decision-making for UMI patients, thereby improving their long-term prognosis. Please see text page 8.

REVIEWS