HealthManagement
Promoting Management and Leadership

Reassessing Contrast-Enhanced MRI in Glioma Surveillance

Magnetic resonance imaging (MRI) is integral to monitoring glioma progression, particularly in long-term survivors. Standard imaging protocols include contrast-enhanced T1-weighted (CET1w) sequences using gadolinium-based contrast agents (GBCA), alongside T2-weighted (T2w) and fluid-attenuated inversion recovery (FLAIR) imaging. However, concerns regarding the necessity, patient burden and environmental impact of GBCA use have prompted questions about whether T2w/T2w-FLAIR imaging alone may be sufficient. A study published in *European Radiology* evaluates whether CET1w provides any additional benefit in detecting glioma progression compared to non-contrast imaging, particularly in patients requiring prolonged surveillance.

Detection of Glioma Progression Without Gadolinium

The retrospective multicentre study included 108 patients with histopathologically confirmed adult-type diffuse glioma who had survived at least two years after diagnosis. Of these, 82 experienced tumour progression during follow-up. Findings showed that progression was detected in 72% of cases using both CET1w and T2w/T2w-FLAIR imaging. However, 24.4% of patients exhibited progression solely on T2w/T2w-FLAIR, while only 3.7% displayed new abnormalities exclusively on CET1w. These results indicate that nearly all cases of tumour progression could be identified without contrast enhancement.

Further analysis revealed that in 44% of patients with progression, abnormalities on T2w/T2w-FLAIR images were evident at a median of 241 days before formal progression determination. This suggests that T2w/T2w-FLAIR imaging may not only be sufficient but could also indicate tumour changes earlier in some cases. Low-grade gliomas (LGG), which require long-term follow-up, were particularly likely to show progression on non-contrast imaging alone. By contrast, only three patients in the entire cohort exhibited new abnormalities on CET1w imaging without corresponding changes on T2w/T2w-FLAIR. The strong correlation between contrast enhancement and non-contrast abnormalities raises important questions about the necessity of routine GBCA administration in glioma surveillance.

Balancing Clinical Utility and Burden of GBCA Use

GBCA use has been standard practice in glioma follow-up due to its ability to enhance tumour visibility. However, its long-term administration presents concerns, including gadolinium retention in brain tissue, potential toxicity and patient discomfort associated with repeated intravenous injections. Additionally, GBCA poses an environmental burden, with increasing awareness of its accumulation in freshwater systems. Patients undergoing prolonged surveillance may receive numerous contrast-enhanced scans over the years, despite the absence of formal guidelines on when to reduce or discontinue contrast administration.

Recommended Read: ***Optimising Multimodal Prompts for GPT-4V in Brain MRI Diagnosis***

This study found that for LGG, which necessitate extended monitoring, tumour progression was primarily detectable using non-contrast imaging. Given this, a more selective approach to GBCA administration may be warranted, particularly for patients with stable disease. Intermittent or targeted use of contrast-enhanced MRI, rather than routine administration, could balance diagnostic accuracy with reducing patient exposure.

Moreover, technological advancements offer promising alternatives. Studies exploring deep learning models suggest that synthetic contrast-enhanced images derived from T2w-FLAIR imaging may provide a reliable substitute for conventional CET1w imaging. These developments indicate that reliance on GBCA could potentially be reduced without compromising diagnostic accuracy, further reinforcing the findings of this study.

Future Considerations for Glioma Surveillance Strategies

While CET1w imaging remains valuable in some cases, this study suggests that its routine use in long-term glioma follow-up may not always be necessary. Given that T2w/T2w-FLAIR imaging was sufficient for detecting progression in most patients, alternative strategies for glioma surveillance should be explored. Techniques such as perfusion-weighted imaging and chemical exchange saturation transfer MRI could provide additional insights into tumour activity without requiring contrast agents.

Further research is needed to determine whether specific tumour characteristics, molecular subtypes or other clinical factors influence the necessity of GBCA in glioma follow-up. Establishing evidence-based guidelines for contrast use, tailored to individual patient needs, could improve both diagnostic efficiency and patient experience. Additionally, assessing whether non-contrast imaging can effectively differentiate between true tumour progression and treatment-related effects, such as radiation-induced changes, will be crucial in refining follow-up protocols.

The findings suggest that T2w/T2w-FLAIR imaging is highly effective in detecting glioma progression, with CET1w rarely identifying changes in isolation. Given the concerns surrounding routine GBCA use, a more selective approach to contrast-enhanced imaging may be justified, particularly for long-term survivors. Future research should focus on refining non-contrast imaging techniques and establishing clear guidelines for glioma surveillance to optimise patient care while reducing unnecessary contrast administration.

Source: European Radiology

Image Credit: iStock

Published on : Mon, 10 Mar 2025