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MRI Brain Metastases for Detecting and Meta-Analysis

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DESCRIPTION

Brain metastases are difficult to detect and can take a long time to physically identify. This is why image studies and artificial intelligence have been used in efforts to automate this process. To the best of our knowledge, no meta-analysis or systematic review on brain metastasis detection utilising deep learning and MRI has been undertaken. As a result, a meta-analysis and study quality evaluation is required in addition to a systematic review to assess the strength of the available evidence. The goal of this study was to undertake a meta-analysis and systematic evaluation of deep learning models that use MRI to detect brain metastases in cancer patients.

Experiments have employed deep learning to automate the time-consuming detection of brain metastases (BMs). The goal of this study was to conduct a meta-analysis and a systematic review to determine how well deep learning models that use MRI to detect BMs in cancer patients performed. A comprehensive search of MEDLINE, EMBASE, and Web of Science was carried out till September 30, 2022. Individuals with BMs were selected for inclusion; the BMs were detected using deep learning on MRI scans; there was enough data to evaluate the detective's performance; and original research publications were also considered. Editorials, reviews, letters, guidelines, or errata were excluded, as were series or case reports with fewer than 20 patients and research with overlapping cohorts.

To assess the quality, the Checklist for Artificial Intelligence in Medical Imaging and the Quality Assessment of Diagnostic Accuracy Studies-2 were utilised. Finally, 24 investigations were determined as being quantitatively viable. The overall detectability of patients and lesions was 89%. The checklists should be followed more strictly throughout the articles. Deep learning systems are capable of detecting BMs with great accuracy. Due to reporting differences, a pooled study of false positive rates was not possible. Around 20% of adult cancer patients have brain metastases (BMs). The most prevalent type of intracranial tumour is adult intracranial neoplasm. Although metastases to the cranium, dura, and leptomeninges are common in BMs, the brain renchyma is the most common intracranial metastatic site. As a result, reliable BM diagnosis is possible.

Contrast-enhanced magnetic resonance imaging is the most routinely utilised imaging diagnosis for BMs (MRI). It diagnoses lesions with more precision than Computed Tomography (CT) or nonenhanced MRI. While Whole-Brain Radiation Therapy (WBRT), which can cause cognitive impairment, has historically been the backbone of BM radiotherapy, stereotactic radiosurgery (SRS) is now the standard of care in many clinical settings. According to a multi-institutional prospective research published in 2014, patients with 5-10 brain metastases who got SRS without WBRT outperformed those with 2-4 tumours. As a result, SRS is becoming more popular, and new systemic medications and treatment approaches, such as hippocampal avoidance-WBRT, are being researched. Our study had certain limitations. The lack of pooled false positive rate analysis was the most significant limitation because there was no uniform unit of reporting false positive rates in the included research. False positives were documented on a per-patient, per-scan, or per-lesion basis in studies. Second, because no study contained findings for different scanners and slice thicknesses, subgroup analysis based on different MRI scanners and slice thicknesses was not possible.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest in publishing this article has been read and approved by all named authors.

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