Abstract

Artificial Intelligence Applications in Pediatric Brain Tumor Imaging: A Systematic Review.

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OBJECTIVE: Artificial intelligence (AI) has facilitated the analysis of medical imaging given increased computational capacity and medical data availability in recent years. Although many applications for AI in the imaging of brain tumors have been proposed, their potential clinical impact remains to be explored. A systematic review was performed to examine the role of AI in the analysis of pediatric brain tumor imaging.

METHODS: PubMed, Embase, and Scopus were searched for relevant articles up to January 27, 2021.

RESULTS: Literature search identified 298 records, of which 22 studies were included. The most commonly studied tumors were posterior fossa tumors, including brainstem glioma, ependymoma, medulloblastoma, and pilocytic astrocytoma (15, 68%). Tumor diagnosis was the most frequently performed task (14, 64%), followed by tumor segmentation (3, 14%) and tumor detection (3, 14%). Of the 6 studies comparing AI to clinical experts, 5 demonstrated superiority of AI for tumor diagnosis. Other tasks, including tumor segmentation, attenuation correction of positron emission tomography scans, image registration for patient positioning, and dose calculation for radiotherapy, were performed with high accuracy comparable to clinical experts. No studies described use of the AI tool in routine clinical practice.

CONCLUSIONS: AI methods for analysis of pediatric brain tumor imaging have increased exponentially in recent years. However, adoption of these methods in clinical practice requires further characterization of validity and utility. Implementation of these methods may streamline clinical workflows by improving diagnostic accuracy and automating basic imaging analysis tasks.