ABSTRACT

Acta Radiol. 2022 Dec 12:2841851221143496. doi: 10.1177/02841851221143496.
Online ahead of print.

Radiomics-based machine learning models for prediction of medulloblastoma subgroups: a systematic review and meta-analysis of the diagnostic test performance.

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BACKGROUND: Medulloblastomas are a major cause of cancer-related mortality in the pediatric population. Four molecular groups have been identified, and these molecular groups drive risk stratification, prognostic modeling, and the development of novel treatment modalities. It has been demonstrated that radiomics-based machine learning (ML) models are effective at predicting the diagnosis, molecular class, and grades of CNS tumors.
PURPOSE: To assess radiomics-based ML models' diagnostic performance in predicting medulloblastoma subgroups and the methodological quality of the studies.

MATERIAL AND METHODS: A comprehensive literature search was performed on PubMed; the last search was conducted on 1 May 2022. Studies that predicted all four medulloblastoma subgroups in patients with histopathologically confirmed medulloblastoma and reporting area under the curve (AUC) values were included in the study. The quality assessments were conducted according to the Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) and Checklist for Artificial Intelligence in Medical Imaging (CLAIM). A meta-analysis of radiomics-based ML studies' diagnostic performance for the preoperative evaluation of medulloblastoma subgrouping was performed.

RESULTS: Five studies were included in this meta-analysis. Regarding patient selection, two studies indicated an unclear risk of bias according to the QUADAS-2. The five studies had an average CLAIM score and compliance score of 23.2 and 0.57, respectively. The meta-analysis showed pooled AUCs of 0.88, 0.82, 0.83, and 0.88 for WNT, SHH, group 3, and group 4 for classification, respectively.

CONCLUSION: Radiomics-based ML studies have good classification performance in predicting medulloblastoma subgroups, with AUCs >0.80 in every subgroup. To be applied to clinical practice, they need methodological quality improvement and stability.

DOI: 10.1177/02841851221143496
PMID: 36510435