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Preoperative assessment of eloquence in neurosurgery: a systematic review

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Abstract

Background and objectives: Tumor location and eloquence are two crucial preoperative factors when deciding on the optimal treatment choice in glioma management. Consensus is currently lacking regarding the preoperative assessment and definition of eloquent areas. This systematic review aims to evaluate the existing definitions and assessment methods of eloquent areas that are used in current clinical practice.

Methods: A computer-aided search of Embase, Medline (OvidSP), and Google Scholar was performed to identify relevant studies. This review includes articles describing preoperative definitions of eloquence in the study's Methods section. These definitions were compared and categorized by anatomical structure. Additionally, various techniques to preoperatively assess tumor eloquence were extracted, along with their benefits, drawbacks and ease of use.

Results: This review covers 98 articles including 12,714 participants. Evaluation of these studies indicated considerable variability in defining eloquence. Categorization of these definitions yielded a list of 32 brain regions that were considered eloquent. The most commonly used methods to preoperatively determine tumor eloquence were anatomical classification systems and structural MRI, followed by DTI-FT, functional MRI and nTMS.

Conclusions: There were major differences in the definitions and assessment methods of eloquence, and none of them proved to be satisfactory to express eloquence as an objective, quantifiable, preoperative factor to use in glioma decision making. Therefore, we propose the development of a novel, objective, reliable, preoperative classification system to assess eloquence. This should in the future aid neurosurgeons in their preoperative decision making to facilitate personalized treatment paradigms and to improve surgical outcomes.

Keywords: Classification; Eloquence; Glioma; Grading; Systematic review.