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Ventricular opening in High-Grade Glioma surgery. Impact on surgical, functional outcomes, and survival rates. Experience in a Latin-American center

Mauro Ruella [a 1], Guido Caffaratti [a], Florencia Yorio [b], Alejandro Muggeri [b], Francisco Marcó del Pont [a], Lucila Domecq [a], Ruben Mormandi [a], Andres Cervio [a]

[a] Department of Neurosurgery, Fleni, Montañeses 2325, Buenos Aires CP1428, Argentina

[b] Department of Neuro-Oncology, Fleni, Montañeses 2325, Buenos Aires CP1428, Argentina

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Highlights

- Ventricular opening during glioma surgery has been suggested as a prognostic factor.
- Ventricular opening did not correlate with survival rates after multivariate analysis.
- A trend towards an increase in resection rates was shown after opening the ventricles.

- Opening the ventricles increases the risk of hydrocephalus or CSF leak.
- Ventricular opening may contribute to increasing the risk of leptomeningeal spread.

Abstract

Objective

Analyze the impact of ventricular opening during surgery for High-Grade Glioma (HGG) on surgical, functional outcomes, and survival rates.

Materials and methods

Retrospective, single-center, analytical study of a cohort of patients who underwent surgery for HGG in an Argentine center between 2013 and 2023.

Patients with Grade IV supratentorial gliomas, 3 months of minimum follow-up, studied with pre and postoperative volumetric MRI were included. Subsequently, ventricular opening during surgery and its influence on prognosis were analyzed.

Results

A total 263 patients met the inclusion criteria, with a mean follow-up of 24.8 months. Mean age was 58.5 years with a predominance of male patients (63 %) and preoperative mean KPS was 80 (range 40–100).

Eighty-eight percent of tumors corresponded to Glioblastomas and the mean preoperative volume was 27.2 cm3.

Ventricular opening was identified in 80 patients (30.4 %) in correlation with the number of patients with ependymal invasion. This factor was associated with worse survival rates and risk of multicentricity in univariate analysis. However, when adjusted for covariables, there was a trend towards higher survival and slight increase in resection rates. Opening the ventricles was associated with a higher risk of leptomeningeal spread and complications such as hydrocephalus and CSF leak.

Conclusion

Ventricular opening during surgery for HGG did not show to represent an independent prognostic factor for survival rates. It could be considered when ependymal invasion is observed in favor of maximizing EOR. Conversely, it should be avoided as it carries a higher risk for complications and tumor spread.

Introduction

Ventricular entry during surgery has been suggested as a prognostic factor for Glioblastoma patients [1], [2], [3], [4], but its impact on surgical, functional outcomes, and survival rates remains controversial.

Studies have demonstrated that ventricular-subventricular zone (VSVZ) invasion negatively influences the prognosis of Glioblastoma patients [5], [6], [7]. Therefore, it is presumed that ventricular opening would ease in increasing extent of resection (EOR) and prognosis [1], [4]. However, the balance between EOR and amount of ventricular entry is still poorly understood [8], as it has also been suggested that ventricular entry during surgery can elevate the risk of CSF tumor spread, increasing the chances of leptomeningeal dissemination (LMD), multicentricity, and early recurrences with a negative impact on survival rates [2], [9]. Furthermore, it has been demonstrated that this surgical maneuver can increase the risks of surgical complications [4], [8], [10], [11].

This study aims to globally analyze the impact of ventricular entry during surgery of patients with High-Grade Gliomas (HGG) in functional and surgical outcomes as in survival rates, based on the new classification of tumors [12], in one of the largest monocentric series reported of HGG, in a Latin American country.

Section snippets

Study design

Retrospective, single-center, analytical study of a cohort of adult patients operated for HGG in a third-level center in Buenos Aires, Argentina, between 2013 and 2023

Medical records, imaging studies, and surgical protocols were reviewed and clinical, radiological, and surgical variables were defined for analysis.

The study was approved by the Ethics Committee of our Institution.

The inclusion criteria were:

- Age greater than 18 years. …
- Initial histological diagnosis of Grade IV Diffuse Glioma (not …

…

Demographics and clinical findings

Table 1 summarizes the clinical characteristics of the population

A total of 591 patients were operated on for HGG during the study period, of which 263 met the inclusion criteria, with a mean follow-up of 24.8 months (range 5–141). Mean age was 58.5 years (range 23–87 years), with a predominance of male patients (63 %).

The most frequent location of tumors was frontal (28.5 %) followed by temporal (21.6 %) and 88 % corresponded to Glioblastomas.

The mean preoperative volume was 27.2 cm3 (range …

Discussion

Identification of prognostic factors is of great importance to guide neurosurgeons in the management of patients with HGG. The primary goal of surgical treatment for HGG is maximal, safe tumor resection [17], [18]. Ventricular entry during surgery is not uncommon in achieving this goal [2], [19]. Given the knowledge that invasion of stem-cells located at the VSVZ is associated with a worse prognosis in these patients [5], [6], [7], ventricular opening during surgery has been suggested as a …

Conclusion

Ventricular opening during surgery for HGG did not show to represent an independent prognostic factor for survival rates, and it could be considered when ependymal invasion is observed in favor of maximizing EOR. Conversely, it should be avoided as it carries a higher risk for complications and tumor spread. Being aware of these associations could help neurosurgeons and neuro-oncologists to manage them accordingly. …

Strengths and limitations

We acknowledge the existence of limitations in our analysis given the retrospective nature of the study which renders it susceptible to selection and recall biases.

Postoperative MRIs were performed within one month of surgery with only 48 % done before 72hs, which may obscure the distinction between residual tumor and surgical changes and the definition of GTR.

It is important to note however that this is the first analysis of its kind performed in a Latin-American center and that analysis was …

CRediT authorship contribution statement

Mauro Ruella: Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Alejandro Muggeri:** Writing – review & editing, Visualization. **Francisco Marco del Pont:** Writing – review & editing. **Guido Caffaratti:** Writing – review & editing, Data curation. **Florencia Yorio:** Writing – review & editing, Visualization. **Lucila Domecq:** Writing – review & editing. **Ruben Mormandi:** Writing – review & editing, Supervision, Project

administration. **Andres Cervio:** ...

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1 ORCID: 0000-0003-2198-6801.

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