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Epidemiological, Clinical, Histopathological, Therapeutic and Outcome Profile of Surgically Treated Intracranial Tumors at the Bouaké Regional Hospital: A Series of 43 Cases

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Abstract

Introduction: The advent of therapeutic tools such as the operating microscope and neuronavigation has improved the management of tumors in general, and intracranial tumors in particular. **Objective:** To determine the epidemiological, clinical, histopathological, therapeutic and outcome profile of intracranial tumors surgically treated at the Bouaké Regional Hospital (CHR). **Materials and Methods:** This was a retrospective descriptive study covering a 14-month period from 1 November 2024 to 31 December 2025. All patients operated on for an intracranial tumor at the Bouaké Regional Hospital were included. Sociodemographic, clinical, paraclinical, therapeutic and outcome data were analyzed. 67 patients were admitted for the management of intracranial tumors during this study period and 43 were operated on. **Results:** During the study period, 43 cases of brain tumors were collected, corresponding to a hospital frequency of 0.64. The mean age was 44.43 years (range, 2 - 83 years). Children and adults accounted for 16.3% and 83.7% of cases, respectively. The sex ratio was 1.26. The time to consultation was less than 3 months in 25.58% of cases. Presenting signs were dominated by intracranial hypertension (72.09%), visual disturbances (60.46%), motor deficit (23.25%), cerebellar syndrome (18.6%) and seizures (18.6%). Comorbidities were present in 22 patients (51.16%) and were dominated by arterial hypertension (20.93%), followed by patients previously operated on for a pituitary adenoma (11.62%).

Hormonal disturbances were present in 13.95% of cases. Supratentorial tumors predominated in adults (97.22%, n = 35), whereas the posterior fossa was the predominant location in children (n = 7). MRI was performed in 34 cases. Histopathologically, the most frequent tumors were meningothelial meningiomas grade I (40%), pituitary adenomas (15%), medulloblastomas (5%) and pilocytic astroma (5%). Macroscopically complete, neuronavigation-guided resection of meningiomas was achieved in 16 of 18 cases (88.9%). The mean hospital stay was 8.2 days. The outcome was favorable in 74.41% (32 cases), with an in-hospital mortality of 25.58% (11 cases). **Conclusion:** The advent of neuronavigation and the operating microscope has facilitated the management of brain tumors in Bouaké. This inaugural study allowed the characterization of patients admitted for the management of an intracranial tumor in Bouaké.

Keywords

Brain Tumors, Central Nervous System, Intracranial Hypertension, Cerebellar Syndrome

1. Introduction

Central nervous system (CNS) tumors represent a major and growing public health challenge worldwide [1]. They encompass all expansive processes—benign or malignant, primary or secondary—arising from the skull, the meninges or the brain parenchyma [2]. Clinically, their presentation classically relies on a symptomatic triad: epileptic seizures, intracranial hypertension (ICH) syndrome and focal neurological deficits [3] [4].

The epidemiology of these tumors constitutes a complex and heterogeneous field of study, with data varying according to geographical origin and based on radiological, histopathological and outcome criteria [5] [6]. However, the precise assessment of their incidence often faces several obstacles, notably the absence of systematic histological confirmation and the fragmentary nature of data collection [6]. Most descriptive studies have identified an increase in the annual incidence of primary brain tumors in industrialized countries, mainly attributable to population aging and improved access to imaging. Comparisons between registries are particularly difficult, possibly because of geographical variations in incidence or differences in coding practices. In all cases, the relatively low incidence of primary brain tumors limits sample sizes [7].

Topographically, the tentorium cerebelli constitutes the fundamental anatomical landmark. A distinction is thus made between supratentorial tumors (involving the cerebral lobes or the deep and median hemispheric structures), infratentorial tumors and lesions extending across both compartments [2]. In children, these conditions present topographical and histological features distinct from those observed in adults [8].

Over recent decades, the integration of advanced technologies such as the operating microscope and neuronavigation has revolutionized surgical management [9]. These advances, combined with a better oncological understanding, have allowed a significant improvement in overall survival and quality of life, with certain histological subtypes now achieving high cure rates [8].

In Bouaké, the incidence of intracranial tumors remains insufficiently documented. This lack of knowledge motivated the present study, whose objective was to define the epidemiological, clinical, histopathological, therapeutic and outcome profile of intracranial tumors surgically treated at the Bouaké Regional Hospital (CHR).

2. Materials and Methods

2.1. Study Design

We conducted a retrospective descriptive study in the Department of Neurosurgery of the Bouaké Regional Hospital (CHR). The study period extended over 14 months, from 1 November 2024 to 31 December 2025.

2.2. Study Population

The study included all patients admitted and operated on for an intracranial tumor during the predefined period. Recruitment was carried out from the hospitalization register and operative reports. All patients who had undergone surgery, without age or sex restriction, as well as all newly diagnosed and operated tumors, surgical revisions and tumors operated on with or without histological findings were included. Unoperated intracranial tumors were excluded.

In accordance with the ethics of retrospective research, written consent was not required. Nevertheless, patients (or their legal representatives) were informed, during telephone follow-up, of the anonymized use of their clinical data for scientific purposes.

2.3. Data Collection

Data were extracted from medical records using a standardized collection form. The variables studied included:

- **Sociodemographic data:** Age, sex and time to consultation.
- **Clinical data:** Medical history, initial Glasgow Coma Scale score, pupillary status, signs of intracranial hypertension (headache, vomiting, visual disturbances), neurological syndromes (cerebellar, pyramidal, frontal, epileptic) and cranial nerve involvement.
- **Paraclinical data:** Imaging modalities (CT and/or MRI), lesion topography, diagnostic hypotheses and histopathological results.
- **Therapeutic data:** Surgical approach, use of technological tools (operating microscope, endoscopy, neuronavigation), quality of tumor resection and mean length of hospital stay.
- **Outcome data:** Admission to the intensive care unit, occurrence of postoper-

ative complications, management of complications and clinical outcome (survival or death).

3. Results

3.1. Epidemiological and Clinical Data

During the study period, 43 cases of intracranial tumors were collected, corresponding to a hospital frequency of 0.64. The mean age was 43.76 years (range, 2 - 83 years), with a predominance of adults (83.7%) over children (16.3%). The sex ratio was 1.26 in favor of men. Children had a mean age of 6.42 years (2 - 11 years) and adults a mean age of 51.02 years (17 - 83 years) (Table 1).

Table 1. Distribution of patients by sex and age group.

Sex	Children	Adults	Total
Male	5	19	24
Female	2	17	19
Total	**7**	**36**	**43**

The clinical presentation was mainly marked by intracranial hypertension syndrome (72.09%) and visual disturbances (60.46%). Other signs included:

- Motor deficits (23.25%);
- Cranial nerve involvement (23.25%, affecting nerves I, II, III, VI and VIII);
- Cerebellar syndrome and seizures (18.6% each);
- Impaired consciousness (13.95%) and frontal syndrome (9.3%).

The time to consultation was less than three months for 25.58% of patients. Comorbidities were present in 51.16% of subjects, dominated by arterial hypertension (20.93%) and a history of surgery for pituitary adenoma (11.62%). Impaired consciousness was observed in 30.23% of patients on admission (Figure 1).

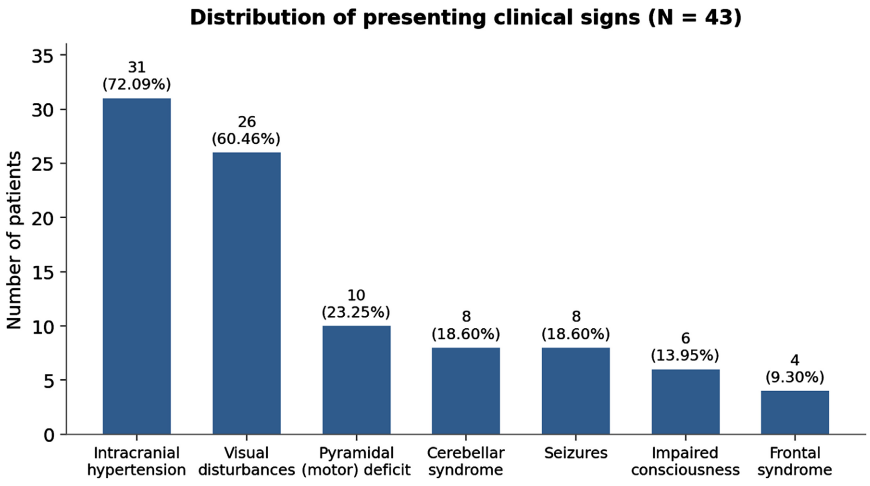

Figure 1. Distribution of presenting clinical signs in the study population (n = 43).

3.2. Imaging and Histopathological Profile

Radiological exploration was based on CT (100% of cases) and MRI (79%; n = 34). The supratentorial topography was predominant in our study (83.7%, n = 35), as well as in adults, with a majority of meningiomas (50%), pituitary adenomas (39%) and gliomas (8%) whose diagnosis was suspected by CT scan (meningiomas) and/or MRI with regard to gliomas and pituitary adenomas and then confirmed by histology. Infratentorial tumors (71.43%) mainly concerned the pediatric population, including 5 cases of medulloblastoma, a craniopharyngioma and a pilocytic astrocytoma (Figure 2, Figure 3).

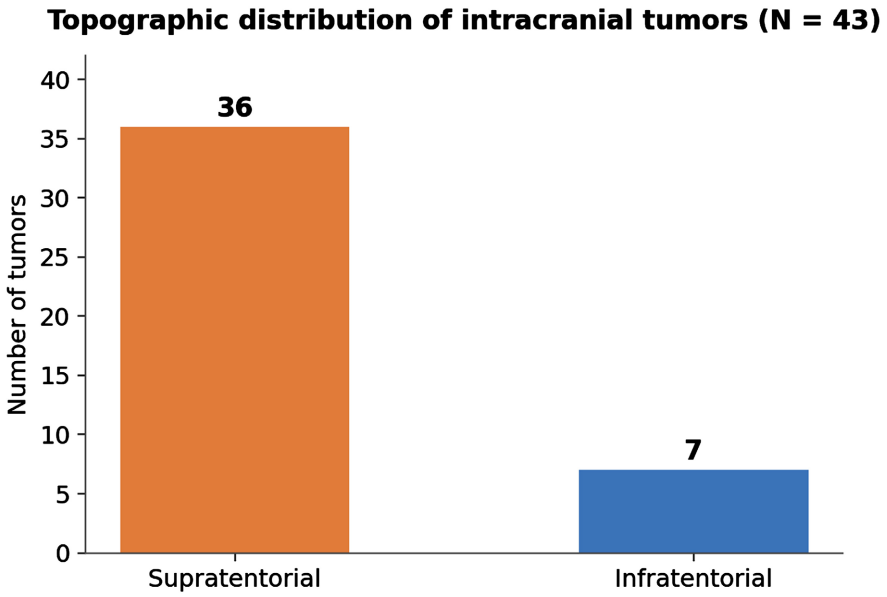

Figure 2. Topographic distribution of intracranial tumors (supratentorial vs infratentorial).

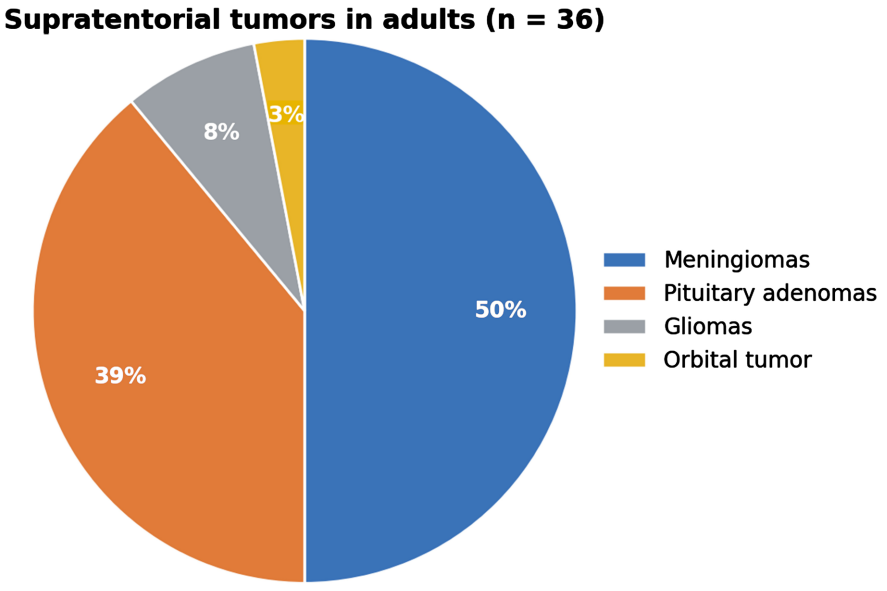

Figure 3. Distribution of supratentorial tumors in adults (n = 36).

Infratentorial tumors (16.3%, n = 7) involved the pediatric population exclusively, including 5 medulloblastomas, one craniopharyngioma and one pilocytic astrocytoma (Figure 4).

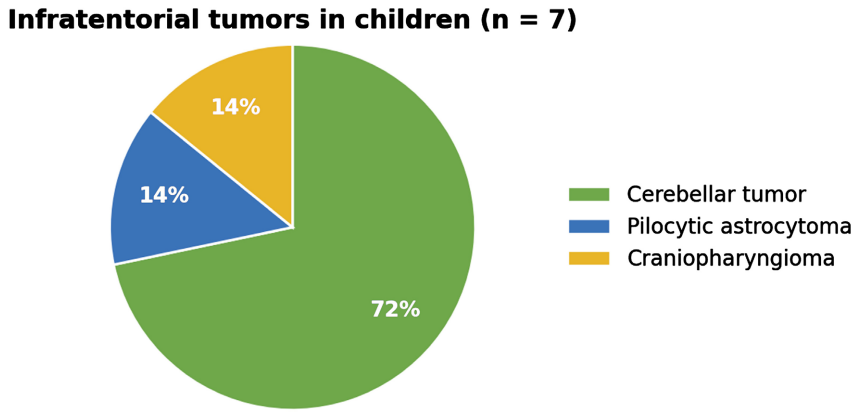

Figure 4. Distribution of infratentorial tumors in children (n = 7).

The mean length of hospital stay was 8.2 days (range, 3 - 21 days).

Histological confirmation was obtained for 46.5% of cases (n = 20), revealing mainly (Figure 5):

- Grade I meningothelial meningiomas (n = 8);
- Grade I neuroendocrine tumors (n = 3);
- Medulloblastomas (n = 3);
- Pilocytic astrocytoma (n = 1);
- Adamantinomatous craniopharyngioma (n = 1);
- Grade I subependymal giant cell astrocytoma (n = 1);
- High-grade gliomas (one grade IV gliosarcoma and one grade IV IDH-wildtype glioblastoma);
- Orbital rhabdomyosarcoma (n = 1).

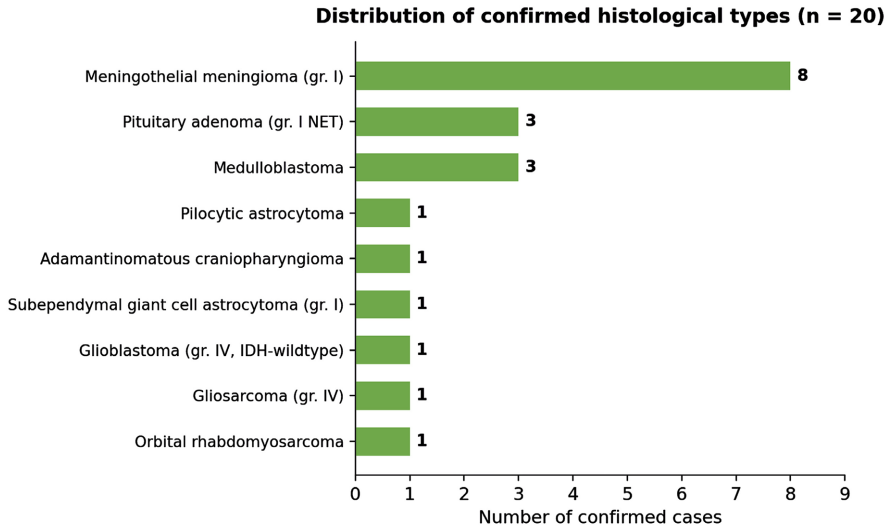

Figure 5. Distribution of confirmed histological types (n = 20).

3.3. Management and Outcome

The time to surgery was less than three months for 23.25% of patients. Surgical modalities included:

- **Pituitary adenomas:** Endoscopic-assisted, neuronavigation-guided endonasal trans-sphenoidal approach (81.81% of cases).
- **Meningiomas:** Macroscopically complete resection under neuronavigation in 16 of 18 cases (88.9%).
- **Posterior fossa:** Systematic prior placement of a ventriculoperitoneal shunt (VPS), followed by subtotal resection (75% of cases).

In the immediate postoperative period, 100% of patients were admitted to the intensive care unit. Complications occurred in 34.88% of cases (n = 15), including seizures, hydrocephalus, tumor recurrence, pulmonary embolism, chemical meningitis and metabolic disorders (diabetes insipidus, ketoacidosis). The overall outcome was favorable in 74.41% of patients (n = 32). The in-hospital mortality rate was 25.58% (n = 11).

4. Discussion

During the study period, the hospital frequency of brain tumors was 0.64%. This frequency is close to that reported by Andrews *et al.* in Ghana (0.31%) [10]. In contrast, higher proportions have been reported by Mambila *et al.* in the Congo, and by Ziguimé and Landouré in Mali, who found 3.32%, 2.7% and 5%, respectively [11]-[13]. Indeed, brain tumors are rare in adults [14]. This low frequency may be explained by limited patient attendance, related either to a lack of awareness of neurosurgical—particularly tumoral—conditions, or to financial concerns regarding the management of these disorders.

The mean age was 43.76 years (range, 2 - 83 years). Basson, in his series, reported a similar mean age of 44 years [1], consistent with all African studies, which found mean ages close to 40.11 and 43 years, respectively [13] [15]. However, this trend appears different in developed countries, where older patients seem to be the most affected, notably in England and Japan, where the mean ages were 62.3 and 59 years, respectively [16] [17]. This discrepancy is likely related to the much higher life expectancy in these countries. In children, we found a mean age of 6.42 years, a result close to that of Broalet *et al.* in Côte d'Ivoire and Mbonda *et al.* in Cameroon, who reported 8 and 9 years, respectively [18] [19].

Children accounted for 16.3% and adults for 83.7% of cases. Supratentorial tumors are far more frequent in adults than in children (86% vs 14%) [11]. Similarly, in the series of Madhi, supratentorial tumors were more frequent in adults than in children (83.77% vs 50%), in contrast to infratentorial tumors, which were more frequent in children than in adults (50% vs 16.67%) [5] [20]. Fatima found that 61.53% of tumors were located in the infratentorial compartment and 38.47% in the supratentorial compartment in children [21].

We noted a male predominance in our study, with a sex ratio of 1.26. This male predominance is also found in the studies of Madhi and Rive [5] [22]. It may be

explained by the small sample sizes of the various series, including our own. Conversely, some authors have reported a female predominance in their series [2] [6] [11]. In general, there is no consensus regarding the relationship between sex and brain tumors, although there appears to be a notable association between female sex and meningiomas, as shown in our series [14] [23]. Men, on the other hand, appear to be more exposed to gliomas [24].

Sixty-five percent of patients came from other cities (Abidjan, Yamoussoukro, Korhogo, Bouaflé) and even from countries of the subregion, such as Benin. This may be explained by the fact that the Department of Neurosurgery of the Bouaké Regional Hospital is the only public facility equipped with neuronavigation and an operating microscope, and by the good collaboration between neurosurgeons of the subregion.

The time to consultation was less than 3 months in 25.58% of cases. These long delays may explain the late diagnosis of brain tumors in our setting. This late presentation to hospital may be related to a low level of education and to the initial recourse to traditional healers.

Presenting signs were dominated by intracranial hypertension (72.09%), visual disturbances (60.46%) and motor deficit (23.25%). These signs vary according to the clinical picture and tumor topography. In the literature, epilepsy is a frequent manifestation in patients with primary or secondary brain tumors; the frequency of epileptic seizures averages between 30% and 50% [25]. In the series of Landouré, the most frequent reason for hospitalization was focal motor deficit (11 cases, 40.7%), followed by headache (6 cases, 22.2%) and epileptic seizures (3 cases, 11%) [13]. In that of Tongavelona *et al.*, presenting signs were intracranial hypertension (18.8%), cerebellar syndrome (13.67%), motor deficit (11.96%), decreased visual acuity (1.7%) and exophthalmos (0.85%) [2]. As for Mambila *et al.*, they found headache in 60%, motor deficit in 49.30% and seizures in 42% [11].

CT was performed in all patients (100%) and MRI as a complement in 34 patients. MRI is the reference examination for the exploration of brain tumors owing to its superiority over CT in analyzing lesion characteristics, location, mass effect, the ventricular system and vascularization [20] [24]. These data reflect the importance of MRI in the diagnosis of brain tumors. Today, the study of brain tumors relies essentially on magnetic resonance imaging [26]. However, this examination is not yet accessible to all, as it remains very expensive for our population.

Supratentorial tumors accounted for all adult cases (n = 36) and comprised meningiomas in 50% (n = 18)—of which 62% (n = 11) were located at the skull base—pituitary adenomas in 39% (n = 14), gliomas in 8% (n = 3) and one orbital tumor (3%, n = 1). These results are comparable to those of the literature [27]. As for infratentorial tumors, they predominated in children, mainly cerebellar tumors, of which 72% were medulloblastomas (n = 5), followed by craniopharyngioma and pilocytic astrocytoma. Mbonda *et al.* found similar results in their study, with a distribution (45.24% supratentorial vs 54.76% infratentorial) comparable to that reported in the literature [19].

The definitive diagnosis of craniocerebral tumors is histopathological. In our study, histological results were obtained for 46.5% of the 43 tumor cases (n = 20). We noted mainly 8 grade I meningothelial meningiomas, 3 grade I neuroendocrine (pituitary) tumors, 3 medulloblastomas, 1 pilocytic astrocytoma, 1 adamantinomatous craniopharyngioma, 1 grade I subependymal giant cell astrocytoma, 1 grade IV gliosarcoma, 1 grade IV IDH-wildtype glioblastoma and 1 orbital rhabdomyosarcoma. These limited results reflect the restricted access to histopathological examination of surgical specimens in our setting, owing to the cost, which remains high.

From a therapeutic standpoint, management depended on the tumor type. Thus, for pituitary tumors, surgery was performed via a neuronavigation-guided, endoscopic trans-nasosphenoidal approach in 81.81% of cases. The use of neuronavigation allowed a better approach in cases of recurrence and in patients with an abnormal sphenoid sinus. Two cases of pituitary macroadenoma required a high pterional approach because of marked suprasellar extension.

As for meningiomas, macroscopically complete resection under neuronavigation was achieved in 16 of 18 cases (88.9%). Regarding posterior fossa tumors, a ventriculoperitoneal shunt was performed first in all our patients, followed by subtotal tumor resection in 75% of cases. This shunting was explained by the presence of hydrocephalus—most often triventricular—due to obstruction of the fourth ventricle. Cerebellar surgery is very delicate because of its intimate relationships with the brainstem anteriorly; the extent of resection was therefore limited so as not to involve the brainstem.

All our patients were admitted to the intensive care unit in the immediate postoperative period (100%). However, 3 patients died there. The causes were respiratory instability in posterior fossa tumors and postoperative hematoma in 2 cases of glioblastoma, which had required decompressive craniectomy.

The mean length of hospital stay was 8.2 days (range, 3 - 21 days). Fifteen complications were recorded: five seizures, three cases of hydrocephalus, two tumor recurrences, two pulmonary embolisms, one chemical meningitis, one diabetic ketoacidosis and one diabetes insipidus. The treatment of these complications consisted of external ventricular drainage for hydrocephalus, surgical revision in cases of significant tumor residue, high-dose heparin therapy in cases of pulmonary embolism, and the use of hydrocortisone for diabetes insipidus.

The outcome was favorable in 74.41% of cases (n = 32), with a mortality rate of 25.58% (n = 11).

Study limitations and perspectives

The significant limitations of this study are its retrospective nature and the relatively small number of patients. For some variables, the amount of missing data was substantial, as this information was based on the review of medical records and operative reports, which were often incomplete. Some patients were not included in the study because of archiving deficiencies. These missing data thus contributed to reducing our sample size.

Our perspectives include the creation of a robust digitized archiving system and the design of a prospective—and even analytical—study in order to determine the mortality factors of intracranial tumors.

5. Conclusion

The analysis of the epidemiology of intracranial tumors within our Department of Neurosurgery, presented here, highlights the concordance of our results with those reported in most international publications. The development and improvement of the healthcare system in our country will contribute not only to increasing the survival rate, but also to improving the short- and long-term quality of life of survivors of this frequent and serious condition.

Author Contributions

Yao Bernard Fionko: Initiator of the study and editor of the manuscript.

Raissa Abibatou Yasmina Diaby: Data analysis.

Faozo Landry Teti, Jean Baptiste Keke, Yves Soress Dongo, Konan Serge Yao: Manuscript reading.

Christiane Désirée Koffi, Jean Jacques Kouassi, Adama Kouadio, Djoko Aboubacar Traore: Data collection.

Louis Derou: Correction and proofreading of the manuscript.

André Tokpa, Aderehime Haidara: Final reading and approval of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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