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Research Article

Surgery Management of Brain Tumor in Low Income City: Rural Experience and Socioeconomic Restraints

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Abstract

Background: Brain tumor surgery requires special equipment but also remains expensive around the world. The aim of this study is to share our experience in brain tumor surgery and the difficulties we encountered (socioeconomic restraints and lack of equipment) to perform brain tumor surgery in low-income country.

Methodology: we did retrospective study in one year, we included all patient who undergone craniotomy for tumor resection at Matlaboulfawzaini hospital. We compared costs of care from our hospital to costs of referral hospital in our capital City.

Results: The study is based on 11 patients.06 males and 05 females (sex-ratio:1,2). The average age was 47 years old. The average cost from diagnostic to discharge was $715 in our hospital and ranging from $400 to $1200 whereas in capital City referral Hospital, it was $1450 ranging from $850 to $2000.The most common tumor types were meningiomas and gliomas found in 36% each fellow by metastatic disease in 27%. Surgery was performed in all case. After 01 month of follow up the 04 patients diagnosed with meningioma had completely recovered. Between 03-06 months of follow up we noted tumor recurrence in 03/4 (75%) patients who had been diagnosed with a glial tumor and 04 (36%) patients died in this study.

Conclusion: the management of brain tumor is still difficult in our region. It's remain expensive for people despite efforts to reduce cost but also the lack of equipment. However, despite all these difficulties, the results are satisfactory.

Keywords: Tumor; Surgery; Socioeconomic; Equipment; Brain

Abbreviations

ICU: Intensive Care Unit; ICP: Increased Intracranial Pressure; MRI: Magnetic Resonance Imaging; CT-Scan: Computertomographie

Introduction

Brain tumor surgery requires special equipment but also remains expensive around the world. In developing countries, many

patients have socioeconomic restraints to access care. The particularity of our country like others, is that there are a very small number of centers (referral hospital in neurosurgery) that practice brain tumor surgery. This means that the waiting list remains long and these neurosurgical centers are often overflowing so some patients get worse and others end up dying to their tumor.

This pushed us, despite the lack of equipment in our city to start surgical treatment of brain tumors. The aim of this study is to share our experience in brain tumor surgery and the difficulties we encountered (socioeconomic restraints and lack of equipment) to perform brain tumor surgery in low-income country.

Material and Methods:

we did retrospective study in one year from February 2021 to January 2022.We included all patient who undergone craniotomy for tumor resection at Matlaboulfawzaini hospital in Touba city and 11 patients were enrolled. We compared costs of care from our hospital to costs of referral hospital in our capital City and costs were expressed in USD throughout. Data were analysed using Microsoft Excel 2016.We collected data regarding their clinical, treatment and follow up characteristics. We use Glasgow coma scale to assess consciousness and Karnofski score for functional impairment. Diagnostic of patients was done by Brain CT scan, no MRI was performed because it doesn't exist in our city. The cases that were excluded from surgeries in our setting were: posterior fossa tumor, paediatric brain tumor and most of skull base tumor.

Intraoperative preparation of patient included positioning without the use of any head fixation, but with a simple doughnut-shaped headrest and rolled-up drapes figure 1.

Figure 1: A) head positioning with rolled up drapes (showed in black arrow) and anatomical landmark for tumor.
B) Craniotomy using Hudson burr hole: green arrow show burr hole.

Surgical procedure: Craniotomy was done using Hudson's burr hole and Gigli's bone saw figure 2.

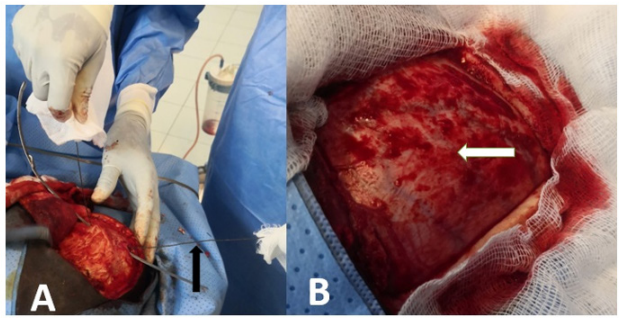

Figure 2: A) craniotomy using Gigli bone saw: showed in black arrow. B) Dura mater after craniotomy: showed in white arrow.

We use anatomical landmarks to found tumor. After opening the dura mater, tumor deboulking and removal were done using bipolar, suction and cotonoid. Tumor excision is usually achieved piecemeal with the bipolar cautery-aided dissection. We do not have any operative microscope or neuro navigation. We perform histological samples and the evaluation of complete removal was done macroscopically figure 3.

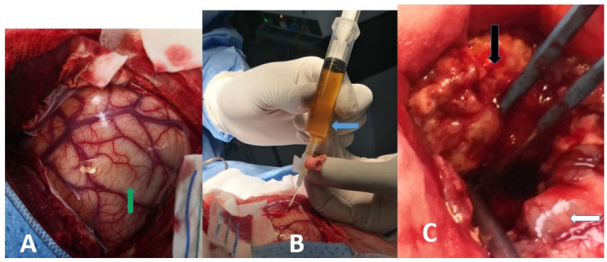

Figure 3: A) Brain cortex after opening the dura in green arrow. B) Tumor cyst puncture in blue arrow. C) Tumor resection: tumor showed in black arrow and normal cortex in white arrow.

Our dural substitute is usually the patient's own tissue, almost always the pericranium and repositioning of the bone flap was done using absorbable sutures.

Postoperative care for patients was provided by general ICU for 24 to 48hours then patients are transferred in surgery department. Patients discharge one week after surgery if we haven't any complication.

Results

The study is based on 11 patients.06 males and 05 females (sex-ratio:1,2). The average age was 47 years old. The average cost from diagnostic to discharge was $715 in our hospital and ranging from $400 to $1200 whereas in capital City (Fann Hospital) the average was $1450 ranging from $850 to $2000.This sum including ward stay, imaging cost, operating time, ICU stay, medication, pathology cost, routine laboratory test and changing dressings (Table 1).

Procedure (total cost)	Cost at Fann Hospital (capital city referral hospital) in USD	Cost at Fawzaini Hospital (our institution) In USD
Ward stay	$50-250	$15-100
ICU stay	$70-100	$35-50
Medications	$200-300	$165-250
CT-scan	$100	$90
pathology	$50	$50
Routine laboratory test	$150-200	$50-120
Changing Dressings every 48 hours	$80-120	$60-100
Surgery	$500	$250
MRI	$250	No
Total average	$1450	$715

Table 1: Itemized cost of surgery per patient at our institution in rural area compare to the Capital city neurosurgery center.

The most common sign was headache and vomiting found in 09 (81%) cases follow by hemiplegia 07 (63%) cases, seizures were found in 03 (27%) and also consciousness in 03 (27%). Glasgow coma scale was < 8 in 02 (18%) cases, between 09-12 in 01 (09%) and > 12 in 08 (72%). CT-scan was performed in all case and parietal or frontoparietal lobes were most location site in 06 (54%)cases. The most common tumor types were meningiomas and gliomas found in 04 (36%) each fellow by metastatic disease in 03 (27%) table 2. Preoperative Karnofski scale was good > 70% in 03 (27%) cases, poor between 40-70%in 05 (45%) cases and very poor < 40% in 03 (27%).

Surgery was performed in all case and the follow up was good. Different types of complications were encountered: cerebrospinal fluid leak 01 case, postoperative monoplegia 01 case and thrombophlebitis 01. No postoperative infection was found.

After 01 month of follow up the 04 patients diagnosed with meningioma had completely recovered.03 (75%) of them are done control CT scan, in 02 cases resection was complete and 01 a tumor residue was found figure 4. For Glioma CT scan was performed 02 days after surgery in 02 cases figure 5.

03/7 (43%) patients were completely recovered from their deficit after one month and the others 04/7 (57%) were partially recovered from their deficit.

Between 03-06 months of follow up we noted tumor recurrence in 03/4 (75%) patients who had been diagnosed with a glial tumor.

04 (36%) patients died in this serie, there were 03 diagnosed High grade glioma and 01 brain metastatic.

Discussion

According to the word bank in 2019 the average monthly income in Senegal (our country) is $119 whereas world average is $962 [1]. More in rural areas of our region, many people work in the informal sector and many patients come from the surrounding villages where sometimes there is no electricity and people struggle to access good care. This justifies why the public hospitals of our regions try to reduce the prices so low compared to our capital city and also compared to the world. Some patients, despite low prices are unable to pay for check-ups and medications, often they are helped by social assistance or contributions organized by the medical staff or others such as mosques, churches and goodwill. In this study the average cost for brain tumor surgery was $715 in our hospital whereas in Egypt Ahmad E. Helal., *et al.* found that the average cost was $1795 [2]. A review of recent literature regarding the cost of craniotomy for tumor resection revealed that the average cost of surgery ranged from $16,977 to $38,662, which may

Sex/age	signs	CT-scan Tumor location	pathology	Follow up 01months	Follow up 03months	Follow up 06months
55/F	ICP, Right hemiparesis	Left temporal lobe	Secondary location Tubullopapillary tumor	Partial motor deficit recovery	Complete recovery from deficit	Adjuvant therapy
55/F	Coma Glasgow 8, left hemiplegia	Right parietooccipital lobe	Adenocarcinoma of breast cancer	Glasgow15 Hemiplegia	Hemiparesis Lung metastasis Adjuvant therapy	Died
42/M	Left hemiplegia	Right Fronto-parietal lobe	Anaplasique astrocytoma gradeIII	Partial motor defict recovery	Complete deficit recovery	Tumor recurrence Adjuvant therapy
63/M	Aphasia, left hemiplegia	Right Fronto-parietal lobe	Giant cell glioblastoma	Partial recovery from motor deficit	Partial recovery from deficit	Tumor recurrence died
35/F	Headache, seizures	Left parietal	Fibroblastic Meningioma grade II	Complete recovery		
70/M	Right hemiplegia	Left Parietal lobe	Diffuse astrocytoma: grade III	Partial recovery from motor deficit	missed	Tumor recurrence died
48/F	Coma, Glasgow8, Seizures	parasagital	Fibroblastic Meningioma grade II	Complete recovery With tumor residue	Tumor residue Under surveillance	residue
32/M	Headache, seizures,	frontal	Meningioma grade I	Complete recovery	Missed	Missed
67/M	Right hemiplegia, aphasia	Left Parietal lobe	High grade glioma	Partial recovery Acute bowel obstruction died		
20/M	Head trauma Left hemiparesis Glasgow10	Frontal lobe	Meningioma OMS grade I	Complete recovery	Complete recovery	
45/F	Seizures, headache	Frontoparietal lobe	Brain metastasis adenocarcinoma of breast cancer	Right monoplegia	Complete recovery from motor deficit	Adjuvant therapy

Table 2: Breakdown of patients according to pathology results, main symptoms, age, sex and follow-up between 1 to 6 months.

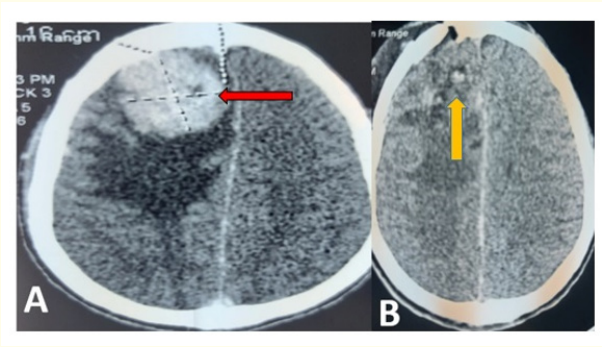

Figure 4: A) Pre-op: Right Frontal convexity meningioma showed in red arrow. B) Post op: complete resection showed in yellow arrow.

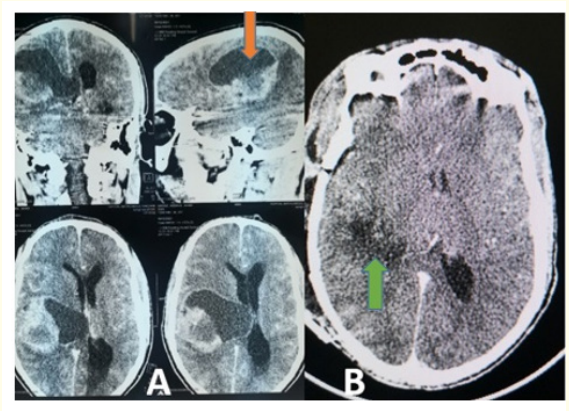

Figure 5: A) Pre op imaging: visualization of right fronto-parietal tumor in orange arrow. B) Post imaging 2 days after surgery: complete resection of tumor in green arrow.

increase even more in the presence of hospital-acquired complications [3-7]. Healthcare costs and cost-effectiveness have become a global health concern (in developing country and also in the world) and in-depth studies of proper cost accrual are being conducted worldwide to exclude unnecessary spending [8,9].

In this study we showed that meningiomas and gliomas remain the most common tumors in brain. In the literature some report predominance of meningiomas whereas others a predominance of gliomas but in general the difference is slight. Ubong Ekpene., *et al.* in Ghana found Glioma as the commonest brain tumor with 38.2%, slightly higher than meningioma accounting for 36.2%, Whereas in South Africa Ibebuike., *et al.* found meningiomas the commonest in 31,8% followed by glioma in 23,2% [10,11].

Meningiomas remain with a good prognosis when a safe surgical resection is performed. For tumors that are growing or causing symptomatology, maximal safe surgical resection remains the standard of care for therapeutic management of meningioma. However, the ability to achieve complete resection may be limited by a number of factors, including tumor location; involvement of nearby dural venous sinuses, arteries, cranial nerves, and brain invasion into eloquent tissue. All of our patients have completely recovered after surgery. Resection was complete in all patients except one who had a parasagittal meningioma invading the sagittal sinus. Given the lack of equipment such as microscope and the risk of high-volume blood loss, we preferred to leave a residue on the sinus. Convexity meningiomas are relatively simple to approach and resect but parasagittal tumors, while still superficial, are more complex to resect because they often involve or invade the sagittal sinus. Often, in instances where the tumor invades but does not completely occlude the sinus, the portion of the tumor within the sinus is not resected due to high risk of air embolism, high-volume blood loss or acute postoperative sinus thrombosis [12,13].

Glioma were the one most frequent tumor in this serie. It was found in 36% and all of them were High grade Glioma (OMS grade III and IV). Their treatment begin with surgery then adjuvant treatment (radiotherapy and chemotherapy). The surgery of brain tumors performs three functions: obtaining a histological diagnosis, improving the condition of the patient by a rapid reduction in tumor volume and finally improving the prognosis. Despite aggressive treatment, these tumors progress, and overall outcomes have not changed much in the past decade [14,15]. In this serie we found that gliomas improved during the first 2 months after surgery. Their Increased Intracranial Pressure regressed and there was a partial recovery from their deficit. Between 03 and 06 months 75% of the patients diagnosed with gliomas have recurred. This is explained one part by delays of pathology results that we receive only 02 months after surgery in our city. There are few histology centers for all the country and all cancers. On the other hand some patients take time before paying for pathology, others as soon as their patient improves they don't find the need to return to the consultation despite explanations. We had 04 deaths in this series,03

were diagnosed as High-grade glioma and 01 brain metastasis. they had recurrences of their tumors but refused a second surgery which was necessary for radiotherapy. In our region brain surgery is still difficult, sometimes linked to socio-cultural beliefs. Many patients continue to consult with traditional healers after seizures or motor deficit because they believe they are bewitched. This delays their care and they come to hospital in serious condition. Referral to literature High-grade gliomas remain incurable despite current therapies, which are plagued by high morbidity and mortality, only ~15-20% of GBM patients survive to 5 years, and no therapies have demonstrated a durable survival benefit in recurrent disease [16-18].

Brain metastasis was the third common tumor in this study (27%cas) and we only operated solitary brain metastasis tumor. 1/3 patient died and 2/3 patients improved, they completely recovered from their deficit after 03 months of follow up. They have been under adjuvant therapy at the oncoradiotherapy center in a capital city. Surgical resection is useful option for brain metastasis. It's improves function and survival, However patient selection remains the most important aspect of management. Extended resection, or microscopic total resection, may have a role in improving outcomes even further, but it needs to be studied in more detail. Multidisciplinary team meetings for combined decision-making in patients with brain metastases is strongly recommend [19-21].

This study is limited first by number of patients that was too small. It's explained by the fact just we started neurosurgery in this city since July 2020.At the beginning we referred all brain tumor to the capital city some end up dying or get worse because of financial problem or the large number of tumor operated there with lack of equipment also.

Second by long delays in pathology results source of recurrence because adjuvant treatment (radiotherapy and chemotherapy) was started late. Sometimes adjuvant treatment didn't perform because of large recurrence that need second surgery and in our hospital patient often refused second surgery.

Conclusion

the management of brain tumor is still difficult in our region. It's remain expensive for people despite efforts to reduce cost but also the lack of equipment. However, despite all these difficulties, the results are satisfactory. Meningiomas (grade I-II after surgery) remain tumors with a good prognostic whereas High glioma with high morbimortality.

Declarations and Acknowledgments

Ethics approval and consent to participate: All patient consented to participate in this study

Consent for Publication

All patient consented for publication. Availability of data and materials: all data and materials are available if needed.

Competing Interests

there is no competitive interest in this study.

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Bibliography

1. JDN: Salaire moyen au senegal. Banque mondial (2019).
2. Ahmed E Helal., *et al.* "Socioeconomic restraints and brain tumor surgery in low-income countries". *Neurosurgical Focus* 45.4 (2018): E11.
3. Latif AZ., *et al.* "The costs of managing patients with malignant glioma at a neuro-oncology clinic". *British Journal of Neurosurgery* 12 (1998): 118-122.
4. Long DM., *et al.* "Outcome and cost of craniotomy performed to treat tumors in regional academic referral centers". *Neurosurgery* 52 (2003): 1056-1065.
5. Martino J., *et al.* "Cost-utility of maximal safe resection of WHO grade II gliomas within eloquent areas". *Acta Neurochirurgica (Wien)* 155 (2013): 41-50.
6. Yarascavitch BA., *et al.* "Levels of evidence in the neurosurgical literature: more tribulations than trials". *Neurosurgery* 71 (2012): 1131-1138.
7. Zacharia BE., *et al.* "Incidence, cost, and mortality associated with hospital-acquired conditions after resection of cranial neoplasms". *Neurosurgery* 74 (2014): 638-647.
8. Herring B and Trish E. "Explaining the growth in US health care spending using state-level variation in income, insur-

ance, and provider market dynamics". *Inquiry* 52 (2015): 4695801561897.

9. Sneh-Arbib O., *et al.* "Surgical site infections following craniotomy focusing on possible post-operative acquisition of infection: prospective cohort study". *European Journal of Clinical Microbiology and Infectious Diseases* 32 (2013): 1511-1516.

10. Ubong Ekpene., *et al.* "Pattern of intracranial tumours in a tertiary hospital in Ghana". *Ghana Medical Journal* 52.2 (2018): 79-83.

11. Ibebuike K., *et al.* "Meningiomas among intracranial neoplasms in Johannesburg, South Africa: prevalence, clinical observations and review of the literature". *African Health Sciences* 13.1 (2013): 118-121.

12. Robin A Buerki., *et al.* "An overview of meningiomas". *Future Oncology* 14.21 (2018): 2161-2177.

13. Leland Rogers., *et al.* "Meningiomas: knowledge base, treatment outcomes, and uncertainties. A RANO review". *Journal of Neurosurgery* 122.1 (2015): 4-23.

14. Walter Taal., *et al.* "Chemotherapy in glioma". *CNS Oncology* 4.3 (2015): 179-192.

15. Lakshmi Nayak and David A Reardon. "High-grade Gliomas". Continuum (Minneap Minn) 6 (2017): 1548-1563.

16. Ricky Chen., *et al.* "Targeted Therapeutics in Patients with High-Grade Gliomas: Past, Present, and Future". *Current Treatment Options in Oncology* 17.8 (2016): 42.

17. Ostrom QT., *et al.* "American Brain Tumor Association Adolescent and Young Adult Primary Brain and Central Nervous System Tumors Diagnosed in the United States in 2008-2012". *NeuroOncology* 18.1 (2016): 1-50.

18. Stupp R., *et al.* "Effects of radiotherapy with concomitant and adjuvant temozolomide versus radiotherapy alone on survival in glioblastoma in a randomised phase III study: 5-year analysis of the EORTC-NCIC trial". *Lancet Oncology* 10.5 (2009): 459-466.

19. Altaf Ali Laghari., *et al.* "Role of surgery in brain metastases". *Journal Of Pakistan Medical Association* 67.8 (2017): 1299-1300.

20. MacGee EE. "Surgical treatment of cerebral metastases from lung cancer: the effect on quality and duration of survival". *Journal of Neurosurgery* 35 (1971): 416-420.

21. Patchell RA., *et al.* "A randomized trial of surgery in the treatment of single metastases to the brain". *NEJM* 322 (1990): 494-500.