A preliminary survey of central nervous system tumors in Tema, Ghana.

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Summary

Background: **In January 2000, the first ever neurosurgical program in Tema was established. This preliminary survey was conducted for the following purposes.**

1) **to determine the relative frequencies of the various histopathological types of CNS tumors.**
2) **To relate the occurrence of the various types of CNS tumors to age, sex, symptoms, neurologic findings and location.**
3) **to review the current use of neurodiagnostic modalities.**

Methods: **A retrospective analysis of the records of 30 consecutive patients seen at T. I. N with histologically proven CNS tumors was carried out. The following parameters were analysed; sex, age, symptoms, neurologic status, surgical procedure, histopathological diagnosis, pre and post operative Karnofsky rating.**

Results: **30 patients (14M, 16F) constituted the series. Their mean age was 39.8 (R 2-72, SD, 18.7) years. The difference between the mean ages of patients with intracranial or spinal tumors was not significant (P>0.05). For intracranial tumors, there was a significant difference between the mean ages of those with infratentorial and supratentorial tumors. Spinal tumors constituted 13% of the series and they all presented with paraplegia. Eighty seven percent had intracranial tumors; of these 27% presented with headaches and 31% with seizures. Only 62% of patients with intracranial tumors presented with neurologic deficits. CT scanning was the diagnostic modality utilized in the diagnosis of all the intracranial tumors. Cerebral angiography was not obtained in any case. Myelography and post myelography CT scanning diagnosed all spinal tumors.**

Surgical procedures for CNS tumors constituted 23% of all neurosurgical surgical procedures performed during the study period. All patients with spinal tumors underwent laminectomy only. Sixty five percent of those with intracranial tumors underwent craniotomy; 34% underwent stereotactic biopsy. The most common intracranial tumor was high-grade astrocytoma (HGA), 23%. The left frontal lobe was the most common location of the intracranial tumors (54%), followed by the left temporal lobe (36%). No significant relationship was demonstrated in the brain tumor sites (P>0.05). At presentation, 46% of those with intracranial tumors had a karnofsky rating >70. One week after surgical intervention, this had increased to 62%. There was no significant relationship between tumor histopathology and preoperative or postoperative Karnofsky rating. The mortality rate in the first 10 days following intracranial tumor surgery was 8%; there were no deaths in the spine surgery group. The post operative complication rate for CNS tumor surgery was 11.5%.

Conclusion: **Intracranial tumors are the most common type of CNS tumors in Tema. More than one third of patients with intracranial tumors presented without neurologic deficits. HGA is the most frequently seen intracranial tumor. All patients with spinal tumors presented with neurologic deficits, specifically paraplegia.**

Keywords: ***Tumors, Spine, Intracranial, Tema, Ghana.***

Résumé

En janvier 1'an 2000, le tout premier programme urochirurgicale à Tema a été crée. Cet étude préliminaire a été effectuée pour des raisons suivantes:

1. Décider la fréquence comparée aux types histopathologiques diverses de tumeurs CSN.
2. Etablir un rapport entre la fréquence des types diverses de tumeurs CS à l'âge, sexe, symptômes, résultat urologique et emplacement.
3. Passer en revue l'utilisation actuelle des modalités neurodiagnostiques.

Methodes: Une analyse rétrospective des dossiers médicaux de 30 patients consecutifs, vue à T.I.N avec des tumeurs CNS histologique a été effectuée. Les paramètres suivants ont été analysés: sex, âge, symptômes, état neurologique, procedure chirurgicale, diagnostique histopathologique. Classement karnofske pré et postopératoire.

Résultats: 30 patients (14M, 16F) sont des éléments des séries constitutifs. Leur âge moyen était 39,8 (R2 – 72, SD, 18.7) ans. La différence entre les âges moyen des patients avec intracrâniens, il y avait une difference importante entre les âges moyen de ceux avec infractentorial et tumeurs supra tentoriales. Tumeurs spinales est recensée en 13% des séries et elles se sont toutes présentée avec paraplégie. Quatre vingt sept pourcentage avaient des tumeurs intracrâniennes, de celles-ci, 27% atteints de maux de tête et 31% atteints de crises. Seulement 62% des patients avec des tumeurs intracrâniennes se sont présentée avec déficit neurologique scannérisation CT était la modalité diagnostic utilisée dans le diagnostic de toutes des tumeurs intracrâniennes. Angiograaphie cérébrale n'était pas obtenue dans aucun cas. La CT scannérisation myclographie et poste myclographie ont diagnostiqué toutes les tumeurs spinales.

Les procédures chirurgicales pour des tumeurs CNS sont recensé en 23% de toutes les procédures neurochirurgicales opérees au cours de cet étude. Tous les patients avec les tumeurs spinales ont subi la laminectomie seulement. Soixante cinq pourcentage de ceux avec des tumeurs intracrâniennes avaient subi la craniotomie, 34% avaient subii la biopsie stéréostatique. La tumeur intracrânienne la plus fréquente était astrocytôme grade-élevé (HGA), 23%. La siège la plus fréquente des tumeurs intracrâniennes était le lobe frontal du côté gauche (54%) suivi par le lobe temporal du côté gauche (36%). Il n'y avait pas un rapport important dans le sièges de la tumeur du cerveau (P>0,05). Pendant hospitalisation, 46% de ceux atteints des

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tumeurs intracrâniennes avaient un classement karnofsky >70. Une semaine après intervention chirugicale, ceci a augmenté à 62%. Il n'y avait pas un rapport important entre tumeur histopathologie et classement karnosfsky pré ou postopératoire. Le taux de la mortalité dans les premiers dix jours de la chirurgie de la tumeur intracranienne était 8%. Il n'y avait pas de morts dans le groupe de la chirurgie de l'épine. Le taux de la complication postopératoire pour la chirurgie de la tumeur CNS était 11,5%.

Conclusion: Des tumeurs intracraniennes sont les types de tumeurs CNS les plus fréquentes à Tema. Plus d'un tiers des patients atteints des tumeurs intracraniennes se sont présenté sans déficits neurologique. HGA est la tumeur intracranienne la plus fréquente. Tous les patients avec des tumeurs spinales se sont présente avec des déficits neurologique, la paraplégie en particulier.

Introduction

In January 2000, the first ever neurosurgical program in Tema was established at the Narh-Bita Hospital. This program serves the 8m people of Ghana and attracts patients from the West African sub-region. This preliminary survey was conducted for the following purposes[1,2].

1. To determine the relative frequencies of the various histopathological types of CBS tumors.
2. To investigate the relationship between the various types of CNS tumors and age, sex, symptoms, neurologic findings and location.
3. To review the current use of available neurodiagnostic modalities.

It is hoped that his will then provide baseline data that will assist in health care planning and an impetus for further detailed studies that will enhance the treatment of patients with CNS tumors in West Africa.

Patients and methods

All patients admitted to and operated on at the Nart-Bita hospital, Tema for CBNS tumor during a 24 month period fro m January 2000 to December 2001 had their medical records retrospectively evaluated and analysed. A preoperative diagnosis of CNS tumor was made in every case by utilising conventional CT criteria in the case of intracranial tumors, myelography with post myelography CT scanning was the mode of diagnosis for spinal tumors. Only the cases that underwent surgery were included in the study. The case records were carefully analysed with respect to age, sex, symptom complex, neurologic status, surgical procedure, histopathologic diagnosis and both pre-operative and post-operative Karnofsky rating.

Statistical analysis

In order to compare two or more groups with outcome variables in more than two categories, a chi squared was used; where indicated, the Yates correction for continuity was applied; $P<0.05$ was considered significant.

Results

During the 24 month study period, there were grand total of 10890 hospital admissions at the Narh-Bita Hospital; of these, 34 (0.31%) had CNS tumor by imaging criteria (CT scans and or myelography). Only 30 patients out of the 34 admitted for CNS tumor underwent neurosurgical procedures. These 30 patients (14M, 16F) constituted the series, they underwent one neurosurgical procedure each. The 30 procedures for CNS tumor constituted 22.3% of the total of 135 neurosurgical procedures undertaken in the Neurosurgical Unit during the study period. In the same period a total of 284 operations for tumors were performed at the hospital; CNS tumors comprised 9% of the total.

Table 1 Location of primary brain tumors in the survey patients

Tumor location	Left side No	%	Right side No	%	Midline No	%	Total
Supratentorial							
Frontal lobe	6	54.5	6	75	–	–	12
Temporal lobe	4	36.4	–	–	–	–	4
Parietal lobe	1	9.9	1	12.5	–	–	2
Occipital lobe	–	–	1	12.5	–	–	1
Pituitary gland	–	–	–	–	3	42.8	3
Pineal gland	–	–	–	–	1	14.3	1
Infratentorial							
Cerebellum	–	–	–	–	3	42.8	3
Brain stem	–	–	–	–	–	–	–
Total	11		8		7		26

The mean age of the 30 CNS tumor patients was 39.8 (R4-70, M41.5, S.D 18.7) years. Four patients (13.3%) had spinal tumors and 26(86.7%) had intracranial tumors. The male/female sex ratio for brain tumors was 1:1.4; while that for spinal tumors was 1:1. Those with intracranial tumors had a mean age of 41.7 years; of this group those with supratentorial tumors had a mean age of 44.0 years; infratentorial tumors 10.8 years. The difference in the ages of the two groups is statistically significant (chi sq. $P<0.05$). The patients with spinal tumors had a mean age of 41.0 years. The difference between the mean ages of patients with intracranial tumors and those with spinal tumors was not statistically significant (chi sq; $P>0.05$).

Table 2 Histopathological classification, frequency and mean age of brain tumor patients

Histopath	No	%	Mean age (yrs.)
HGA	6	23.1	41.8
LGA	5	19.2	34.6
Meningioma	5	19.2	48.6
Pit. Adenoma	3	11.5	43.0
Ependymoma	2	7.7	34.0
Med'btoma	2	7.7	10.5

Table 3 Definition of Karnofsky scale

100	Normal: no complaints, no evidence of disease
90	Able to carry on normal activity, minor symptoms
80	Normal activity with effort, some symptoms
70	Cares for self, unable to carry on normal activity
60	Requires occasional assistance, cares for most needs
50	Requires considerable assistance and frequent care
40	Disabled, requires considerable assistance and frequent care
30	Severely disabled, hospitalised, death imminent
20	Very sick, active supportive treatment needed
10	Moribund, fatal processes are rapidly progressing

Table 4 Initial Karnofsky ratings for groups in survey

Tumor Histology	<70 No	%	>70 No	%	Total Cases
HGA	4	66.7	2	33.3	6
LGA	2	40.0	3	60.0	5
Meningioma	3	60.0	2	40.0	5
Pit. Adenoma	2	66.7	1	33.3	3
Ependymoma	2	100	–	–	2
Med'btoma	1	50.0	1	50.0	2
Metastatis	–	–	1	100	1
P'blastoma	1	100	–	–	1
M.myeloma	–	–	1	100	1
Total	15	57.5	11	42.3	26

1. ***Clinical presentation and diagnosis***

Intracranial tumors

Seizures were the most common presentation and was present in 8(30.8%) of the patients; this was followed by chronic headaches (more than 3 months duration), which was present in 7 patients (26.9%). Only 16 patients (61.5%) had neurologic deficit on clinical evaluation at initial presentation; no neurologic deficit was found in 10 patients (38.5%).

Each patient had a head CT scan with and without intravenous administration of contrast media. Cerebral angiography of MRI was not obtained in any case.

Spinal tumors

All the patients presented with paraplegia with long tract signs and sensory deficit. Neuroradiologic diagnosis was obtained in each case by performing complete myelography and post myelogram CT scan.

Table 5 Postoperative Karnofsky ratings for groups in survey

Tumor Histology	<70 No	%	>70 No	%	Total Cases
HGA	2	33.3	4	66.7	6
LGA	2	40.0	3	60.0	5
Meningioma	1	20.0	4	80.0	5
Pit. Adenoma	1	33.3	2	66.7	3
Ependymoma	2	100	–	–	2
M'Blastoma	2	100	–	–	2
Metastatis	–	–	1	100	1
P'blastoma	1	100	–	–	1
M.myeloma	–	–	1	100	1
Total	11	42.3	15	57.5	26

2. ***Tumor location***

Intracranial

There were no patients with multiple intracranial tumors. 12(46.%) of the 26 patients had tumors located in the frontal lobe; 4(15.4%) in the temporal lobe; 2(7.7%) in the parietal lobe and 1 (3.8%) each in the occipital lobe and pineal gland. 3(11.5%) each had tumors in the pituitary and posterior fossa.

Table 6 Surgical complications for intracranial tumors

Complication	No	%
Wound infection	1	3.8
Hemorrhage at operative site	1	3.8
Increase in neurologic deficit	1	3.8

Spinal

There were 4 patients, constituting 13.3% of the entire series. All the spinal tumors (100%) were extradural and did invade osseous tissue.

3. ***Sidedness/lateralisation***

Intracranial

Seven tumors (26.9%) were in the midline. A total of 19(73.1%) tumors could be localized clearly to either the left or right of the anatomic midline of the brain. 11(42.3%) were located to the left side and 8(30.8%) on the right side. There was no statistically significant relationship between the location of the intracranial tumors (chi sq; P>0.05).

Spinal

All four spinal tumors (100%) did invade osseous tissue and were located predominantly on the right side of the thecal sac.

4. ***Histopathology***

Intracranial

A total of 11 (42.3%) had astrocytoma comprising 6(23.1%) with high grade astrocytoma (HGA) and 5 (19.2%) with low grade astrocytoma (LGA). 5 patients (19.2%) had meningioma; 3(11.5%) pituitary adenoma; 2(7.7%) each had ependymoma and medulloblastoma; 1 (3.8%) each had metastatic tumor, pinealoblastoma and multiple myeloma. The mean ages of the patients with LGA and HGA were 34.6 and 41.8 years respectively; the meningioma patients had a mean age of 48.6 years. There was no statistically significant relationship between the mean ages of the patients and the histology of the brain tumor when LGA, HGA and meningioma were considered (chi sq; P>0.05).

Spinal

Two patients had hemangioendothelioma, constituting 6.7% of the entire series of CNS tumors and 50% of spinal tumors. One patient each had non-Hodgkins lymphoma and benign schwanoma.

5 ***Karnofsky rating***

Intracranial

Fifteen patients (57.7%) had a preoperative Karnofsky rating of <70; 42.3% had a Karnofsky rating of >70 preoperation. Post surgery 15 (57.7%) had a rating of >70 while only 42.3% had <70. The preoperative and postoperative Karnofsky ratings with respect to tumor histology are listed in Tables 4 and 5 respectively. Tumor histology (LGA, HGA, meningioma) and preoperative or postoperative Karnofsky ratings do not have a statistically significant relationship (chi sq; P>0.05).

6 ***Complications***

Intracranial

There was no operative mortality. Two patients (8%) died within the first 10 days following surgery. One died suddenly on the third post operative day following a posterior fossa craniectomy for excision of a medulloblastoma; the other died on the ninth post operative day from acute hydrocephalus after stereotactic biopsy of an anaplastic astrocytoma that extended from the forth ventricle into the brain stem. There was 1(3.8%) cephalohematoma; 1 patient (3.8%) had an increase in neurologic deficit (first 24 hours) and 1 patient (3.8%) had a superficial scalp wound infection. The total surgical complication rate was 11.5%.

Spinal

There was no operative mortality and no surgical complication.

Discussion

In 1944, Muzawi et al claimed that primary intracranial tumor was rare in the African[3]. This assertion has not been borne out by subsequent studies. Levy found that 12% of his neurosurgical patients in Zimbabwe had intracranial tumors[4], Giordano recorded primary brain neoplasms in 7% of the admissions on the neurology service in Abidjan[5] and 4.4% of all hospital admissions at the Fann Hospital in Dakar had brain tumor[6]. The overall frequency of CNS tumors in our practice was 0.31% of all hospital admissions, 9% of all operations for tumor and 22% of all neurosurgical procedures undertaken. Since all this is a hospital based study, no accurate incidence of these tumors could be reached. The number of intracranial tumors in our series represents a 52% increase in the number managed at the Korle-Bu Teaching Hospital from 1969 – 1971[7].

A higher ratio of spinal tumors to intracranial tumors has been reported in Africans as compared to Europe. It has been conjectured that this is because there is a higher death rate amongst Africans with intracranial tumors before hospital treatment[8,9]. The ratio of intracranial tumors to spinal tumors in our series was 6:1; Ruberti et al reported a ratio of 4:1[8,9]. males constituted 50% of the spine tumor patients. A preponderance of male patients has been reported in all the spine tumor series in Africa[10]. The overall frequency of spinal tumors in our neurosurgical operations was 3%. Again, it is impossible to offer an accurate incidence of these tumors since our study is hospital based.

The most common presenting symptoms in patients with brain tumors are headache and seizures and/or progressive neurologic deficit[11]. This is in conformity with our findings. However, a smaller percentage of our patients complained of headache, 27%, when compared to the findings of Mahaley et al, 54%[11]. This is in spite of the fact that their series consisted of 3.1% of cerebellar tumors and ours 11.5%. When categorized by tumor location, they had observed that headache was associated with 70–80% of cerebellar or ventricular tumors where hydrocephalus is more likely. Conversely, even though they had 15.4% paerietal tumors as compared to our 3.8%, our percentage of patients presenting with neurologic deficit (61%) was similar to theirs (68%); this is in spite of their finding of a 75% association of functional loss with parietal lobe tumors. Our study also confirmed that of the primary brain tumor sites, the frontal lobe was most common followed by the temporal lobe; but this was followed by the posterior fossa and then the pituitary instead of the parietal followed by the occipital lobes[11]. (Table 1).

Astrocytoma was the predominant group of intracranial tumor with an incidence of 42%; this group comprised of HGA, 23% and LGA, 19%. HGA in our series constituted 38% of all gliomas. However, HGA has been reported to be rare in Africa except in Senegal and La Cote d'Ivoire[10]. In Senegal, HGA was reported to constitute 51% of all gliomas, was predominant in females, more likely to be situated in the supratentorial compartment and with uniform cerebral distribution; a male preponderance was reported from La Cote d'Ivoire[10]. There was no oligodendroglioma in our series and none was reported in the series reported from Senegal and Zimbabwe[6,12]. The incidence of gliomas in our series (62%) was much higher than the 48% quoted by Glauser for Africans in Zimbabwe[20]. This is also significantly higher than the 21 – 56% incidence reported by 'Adeloye[10] and in contradistinction to the fall in glioma incidence in Africa reported by several authors in the 70's [20,21,22]. This fall in glioma incidence was accounted for then, by the increase in other tumors such as pituitary adenoma and metastatic tumors. In Ibadan, pituitary tumors were reported to have risen from 13% in 1965 to 29% in 1981; in Uganda a 500% increase over two decades to 1980 was reported[10,23]. Our pituitary tumor incidence (13%) does not reflect this reported increase in non-gliomatous brain tumors over the decades and we found only one metastatic intracranial tumor, an adenocarcinoma from a bladder primary that was excised 10 years before.

The incidence of meningiomas in our series(19%), lies at the lower range of rates quoted for Africa,19–33%[10] and at the upper range for non-Africans series, 13–19% [24,25,26,27]. Their incidence is second only to gliomas. Even though our neurosurgical unit is young and our series relatively small, our incidence of meningiomas is much lower than the rates of 47% and 45% reported for units in Accra and Lagos respectively when in their infancy[10]. This significant difference may be on account of our capability to utilise stereotactic techniques at the inception of our unit, since this enables us to approach deep seated small lesions safely, whereas earlier workers may have had to leave such lesions out of their series[7,13]. Our meningioma/glioma ratio of 1/3.2 is radically different from the 2/1 reported from the Transvaal[22]. Fifteen percent of meningioma in the Transvaal exhibit malignant features, while a 3% incidence of malignancy in Africa is reported[10]. Malignant meningiomas remain a controversial topic because of a lack of universally accepted histological criteria for malignancy and the paucity of large series to evaluate the problem. Of all the meningioma subtypes, malignant meningiomas represent 1–11%[28,29,30,31,32,33]. We had one case of an angioblastic meningioma where after a gross total resection with postoperative CT confirmation, radiation therapy was administered; there has been no CT evidence of recurrence after 30 months of follow-up. There was no operative mortality for meningiomas in our series. Prior operative mortality rates in Africa for meningiomas had been reported from 9 – 33%[10].

Our mortality rate for brain tumors was 8%; both patients who died had posterior fossa procedures performed; one died suddenly four days after a posterior fossa craniectomy for excision of medulloblastoma while an intraoperative external ventricular drain was in place with a GCS 15; the other died nine days after the biopsy of a cerebellar lesion (anaplastic astrocytoma) with extension into the brain stem even though preop, there was no evidence of hydrocephalus. Autopsy revealed massive acute hydrocephalus with brain stem infarction. Our surgical complication rate (11.5%) is less than that reported by Mahaley et al (17.4%)[11]; but our wound infection rate of 4%, is at least 100% higher. This points to the need for better infection

control strategies in our institution. There was no mortality or morbidity for spinal tumor surgery.

The clinical and functional ability of the brain tumor patient at the time of treatment is known to be a strong predictor of outcome. Most of our patients (59%) were unable to carry out normal functional activities at presentation (Karnofsky <70) and no relationship could be demonstrated betweeen tumor histology and presenting Karnofsky rating. Generally, the more anaplastic the histopathology of the patients tumor, the lower the presenting karnofsky rating was likely to be; higher ratings are also correlated to an overall younger age[11]. Our study did not demonstrate a relationship between tumor histology and post-operative Karnofsky rating either. This findings may be attributed to the late reportage of our patients or the advanced nature of tumor disease at presentation. This is supported by the relatively large percentage with poor Karnofsky rating at presentation in spite of the low mean age of the patients. Since higher initial Karnofsky ratings are a strong predictor of 5-year survival rates, earlier presentation of patients with brain tumors in Africa for definitive treatment will improve survival.

Conclusion

CNS tumors constitute 0.31% of all hospital admissions; in Tema, surgery for CNS tumor constitutes 9% of all operations done for tumors and 23% of all neurosurgical operations. Intracranial tumors are the most common form of CNS tumors (87%). The mean age of the patients with brain tumors is 42 years. The most common symptoms are seizures and headaches. More than a third do not have neurologic deficit on presentation. Astrocytoma was the commonest tumor (42%) comprising 23% HGA, 19% LGA. Meningioma was next, constituting 19% of brain tumors. There was no correlation between initial Karnofsky rating and histologic diagnosis. All patients with spinal tumors presented with paraplegia. Surgical complication rate for brain tumor surgery was 11.5%; the mortality rate was 8%. There was no mortality or morbidity for spine tumor surgery.

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