Features and Outcome of Surgical Management of Spinal Tumors in a Cohort of Nigerian Patients

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OBJECTIVE: **There is a dearth of information on operated cases of spinal tumors in patients in sub-Saharan Africa. The objective of this study was to evaluate the histologic pattern, anatomic distribution, and extent and outcome of surgery of Nigerian patients with spinal tumors.**

METHODS: **This retrospective study comprised a cohort of Nigerians who underwent surgery for spinal tumors. Data obtained included patient demographics, duration of symptoms, anatomic location, imaging findings, Frankel grading before and after surgery, and type and outcome of surgery. Univariate analysis was performed, and results were compared with results from other parts of the world.**

RESULTS: **There were 59 patients (male-to-female ratio 1:1.1) with a bimodal age distribution. The highest (20.34%) incidence was seen in the 20–29 age group. More than half (58.06%) of the patients presented with a duration of symptoms of at least 6 months (duration of symptoms was >12 months in 35.48%). Motor deficit was present in 97.73% of patients at presentation. Functional grading was Frankel A in 38.10% of patients, Frankel C in 26.19%, Frankel B in 16.67%, Frankel D in 16.67%, and Frankel E in 2.38%. The tumors were mostly in the thoracic region (65.45%), and 58% were extradural in location. Gross total tumor excision was performed in 50.88% of the cases, and subtotal resection was performed in 24.56%. Spinal stabilization was performed in 17.86% with spinous process wiring and vertical strut being the most common method of stabilization (80%) among this group. Metastasis was the most common histologic tumor type (23.21%). Meningioma accounted for 12.50% of tumors, and ependymoma, astrocytoma, and hemangioma each accounted for 7.14%. The most common source of metastasis was the prostate (38.46%). Postoperatively, 45% of patients improved neurologically, 52.5% remained the same, and 2.5% deteriorated. There was no perioperative mortality.**

CONCLUSIONS: **Metastasis was the most common histologic type of spinal tumor in this study, and the most common location was extradural. The outcome was satisfactory in most cases with neurologic function remaining the same or improving after surgery in most patients.**

INTRODUCTION

Spinal tumors are commonly encountered in neurosurgical practice. The spine is the third most common site of abnormal cell proliferation (18). Tumors can arise from the spinal cord or its surrounding structures or occur as metastasis from other locations in the body. They cause significant morbidity with patients having poor neurologic status (3, 20). Spinal tumors can be classified as extradural or intradural; the latter tumors are further classified as extramedullary or intramedullary. The clinical presentation is usually related to the location and nature of the lesions. They may progress slowly or sometimes develop rapidly, especially malignant and aggressive neoplasms. Treatment of spinal tumors is complex, and a multidisciplinary approach is required (2). Contemporary treatments include surgery, radiation therapy, and chemotherapy (2, 6, 8, 9, 19). Surgery for spinal tumors is particularly challenging in view of the delicate nature of the surrounding structures. There is a dearth of information on

Key words
- Nigerians
- Outcome
- Spinal tumor
- Surgery

Abbreviations and Acronyms
FNAC: Fine-needle aspiration cytology

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operated cases of spinal tumors in patients in sub-Saharan Africa. Little is known about the clinicoradiologic features and outcome of surgery for these lesions in this part of the world. The objective of this study was designed to evaluate the clinical features, anatomic distribution, histologic pattern, and extent and outcome of surgery in a cohort of Nigerians with spinal tumors who presented to our service.

MATERIALS AND METHODS

This is a retrospective study of all the patients who presented to our service and subsequently underwent surgery for spinal tumors between January 2004 and September 2013. Data were collected from hospital case notes and operation and pathology registers. We obtained data on the age and sex of patients, duration of symptoms before presentation, presenting symptoms, anatomic location of the tumors, imaging findings, preoperative and postoperative Frankel grading, histology and type of tumors, outcome of surgeries, and duration of follow-up. Univariate analysis was performed and results were compared with results from other parts of the world.

RESULTS

The study population comprised 28 male and 31 female patients, with a male-to-female ratio of 1:1.1. There was a bimodal age distribution with the highest incidence seen in the 10–29 and 40–59 age groups (Figure 1). The mean age of patients was 43.49 years ± 19.72.

Data on clinical presentation were available for 39 patients. Among these, motor deficit was present in 97.73% of patients at presentation; only 1 patient (2.27%) presented with pain only. More than half (58.06%) of the patients presented with symptoms of at least 6 months' duration with 35.48% presenting with symptoms lasting >1 year. Preoperative functional grading was Frankel A in 38.10%, Frankel C in 26.19%, Frankel B in 16.67%, Frankel D in 16.67%, and Frankel E in 2.38%.

Of the tumors, 65% were in the thoracic region, and 16.36% were in the cervical region (Table 1). Extradural location was the most common accounting for 58% of the cases; 22% were intradural-intramedullary, 18% were intradural-extramedullary, and the remaining 2% spanned extradural and intradural anatomic regions. Gross total tumor excision was performed in 50.88% of the cases, and subtotal resection was performed in 24.56% (Table 2). Spinal stabilization was performed in 10 patients; 8 of these had spinous process wiring and vertical strut (Adeolu et al. technique) (1); 1 patient each had pedicle screws with rod and spinous process wiring (Rogers' wiring technique) (16).

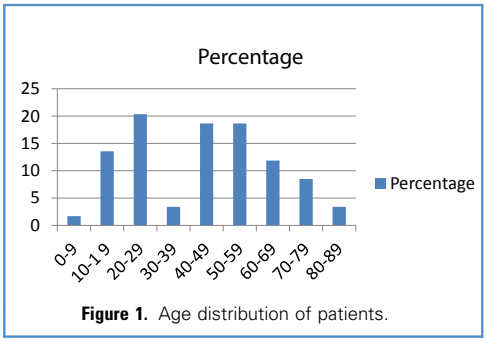

Figure 1. Age distribution of patients.

Table 1. Regional Distribution of Spinal Tumors

Region	Frequency	Percentage
Cervical	9	16.36
Thoracic	36	65.45
Lumbar	3	5.45
Craniocervical	2	3.64
Cervicothoracic	3	5.45
Thoracolumbar	2	3.64
Total	50	100

Histology was available for 56 patients; metastasis was the most common histologic tumor type accounting for 23.21%, followed by meningioma in 12.5% of cases, and ependymoma and astrocytoma each accounted for 7.14%. Further histologic types are as shown in Table 3. Astrocytoma was the most common tumor type in patients <30 years old accounting for 20%, whereas hemangioblastoma and lipoma accounted for 15% and 10%, respectively, in this population. The prostate was the most common source of metastasis in this population (38.46%).

Information on postoperative status was available in 40 patients. Neurologic status improved in 45% (18 of 40) of patients postoperatively. Neurologic status improved by 2 or more Frankel grades in 12 (66.66%) patients, and it improved by a single Frankel grade in 6 (33.33%) patients. Of 40 patients whose preoperative and postoperative Frankel grades were available, 14 (35%) had Frankel A. Of these patients, 6 (42.86%) improved, all by 2 or more Frankel grades. Of 6 patients, 5 (83.33%) improved from Frankel A to Frankel D; 1 patient (16.66%) improved from Frankel A to Frankel C. Table 4 summarizes the postoperative outcome. The mortality rate was 10.52% in this series. None of the deaths occurred within 30 days of surgery. Only 48.48% of the patients were followed for >6 months. Illustrative images of some of the patients in the series are shown in Figures 2–4.

Table 2. Extent of Surgical Resection

Extent of Resection	Frequency	Percentage
Gross total resection	29	50.88
Subtotal resection	14	24.56
Open tumor biopsy	2	3.51
FNAC	3	5.26
Extent of resection not otherwise stated	9	15.79
Total	57	100

FNAC, fine-needle aspiration cytology.

Table 3. Histologic Diagnoses

Histology	Frequency	Percentage
Metastasis	13	23.21
Prostate	5	
Breast	2	
Mesothelioma	1	
Basal squamous cell carcinoma	1	
Metastatic carcinoma	2	
Metastatic adenocarcinoma	2	
Cavernous hemangioma	1	1.79
Multiple myeloma	2	3.57
Plasmacytoma	2	3.57
Meningioma	7	12.50
Ependymoma	4	7.14
Astrocytoma	4	7.14
Hemangioma	4	7.14
Lipoma	2	3.57
Schwannoma	1	1.79
Neurofibroma	1	1.79
Ganglioneuroma	1	1.79
Others	14	25.00
Total	56	100.0

DISCUSSION

We evaluated 59 Nigerian patients with spinal tumors who underwent surgical intervention. There were 28 men and 31 women (male-to-female ratio 1:1.1) in this study; this is in contrast to male preponderance reported by some other authors (2, 3, 10, 11, 13, 17). The age range was 9–83 years with a mean age of 43.49 years ± 19.72. Bhatti et al. (3) reported a mean age of 37.72 years ± 8.94 in their series. There was a bimodal age distribution in this series with peaks at 10–29 and 40–69 years. Avramov et al. (2) reported peak incidence at 41–60 years, whereas in the series by Moein et al. (13), the peak age incidence was 20–44 years. In the present study, 64.4% of the patients were ≥30 years old. The age group 0–19 years accounted for 15.25% of patients in our review. This is similar to 16% reported by Moein et al. (13).

Table 4. Postoperative Status of Patients at Last Clinic Attendance

Outcome	Number	Percentage
Neurologically the same	21	52.5
Improved	18	45.0
Deteriorated	1	2.5
Total	40	100

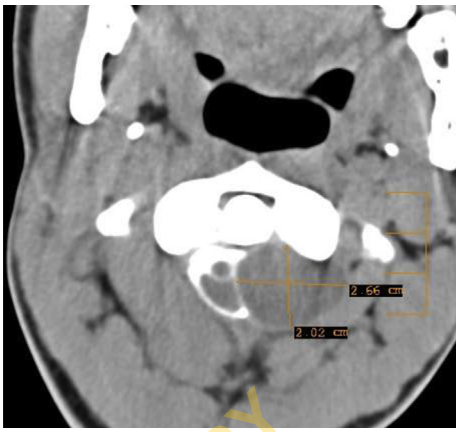

Figure 2. Computed tomography myelography image showing left extradural schwannoma at the level the atlas. The patient underwent hemiresection of the posterior arch of the atlas and gross total excision of the lesion.

Most of our patients (97.73%) had motor deficit at presentation. Avramov et al. (2) reported motor deficit in 81.97% of patients at presentation, whereas Bhatti et al. (3) reported motor deficit in 66%.The high percentage of motor deficit at presentation in our patients may be due to late presentation of our patients. More than half (58.06%) of our patients presented with a duration of symptoms of at least 6 months, with the symptom duration >12 months in 35.48%. This was in contrast to symptom duration of 2–6 weeks widely reported by other authors (2). In the series by Bhatti et al. (3), the mean duration was 6.8 months. Ignorance and poor access to health care services may be responsible for the late presentation and severe deficits at presentation in our patients. The functional grading was Frankel A–C in 80.96% with 38.10% being Frankel A. In the series by Maratos et al. (11), 72% of patients were Frankel D; in the study by Bhatti et al. (3), 33% were Frankel B.

The thoracic region was the most commonly affected spinal region accounting for 65.45% of cases. Similar findings have been widely reported in the literature (2, 7, 8, 10, 14). The thoracic spine is the longest region of the spine, which, at least partly, explains this finding. More than half (58%) of the tumors were extradural in location. This finding was in agreement with the study by Odeku et al. (15) and reports from other parts of the world (2, 7, 9). Gross total tumor excision was achieved in 50.88% of patient, and 24.56% of the patients had subtotal resection. Bhatti et al. (3) were able to achieve gross total tumor resection in 72% of their patients. The goal of surgery in subtotal resection is to obtain tissue for definitive diagnosis, decompress the spinal cord as safely as possible, and stabilize the spine in the event of established or imminent instability. Further surgery—for example, an anterior approach with further tumor resection or adjuvant therapy in the form of chemotherapy or radiotherapy—may be considered after the histologic diagnosis is established. Many patients in this category often have locally infiltrative lesions.

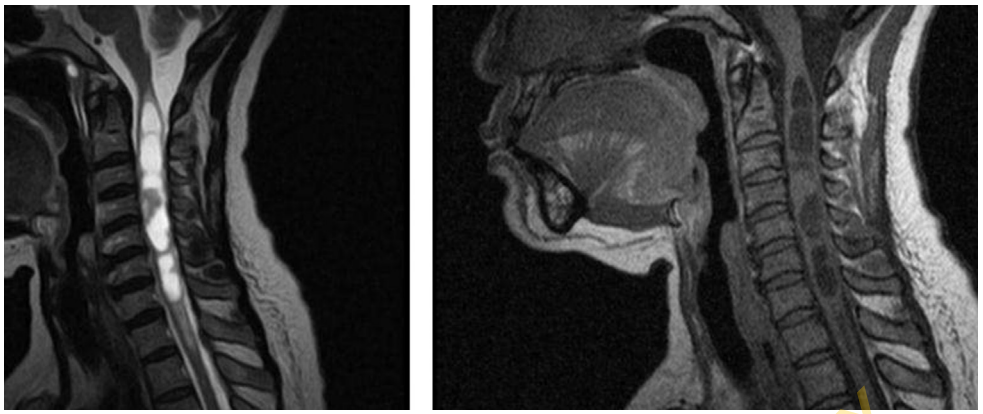

Figure 3. Preoperative magnetic resonance imaging showing syringomyelia extending from the atlas to the upper part of T2 with a solid tumor at the level of C4.

One indication for surgery in the management of spinal tumors may be the need for stabilization of the spine (2, 5, 6, 8, 9, 14). Also, the surgical treatment of spinal tumors may lead to spinal instability requiring stabilization (12). Spinal stabilization was performed in 17.86% of our patients, with spinous process wiring and vertical strut as described by Adeolu et al. (1) being the most common method of stabilization accounting for 80% of patients in this category. Stabilization with pedicle screws and rods was done in 1 patient.

Metastasis was the most common histologic tumor type in this study accounting for 23.21%.This same observation was widely reported in other studies (2, 7, 19). Meningioma accounted for 12.50%, and ependymoma, astrocytoma, and hemangioma each accounted for 7.14%. In patients <30 years old, astrocytoma was the most common histologic tumor type accounting for 20% of cases, followed by hemangioma (15%) and lipoma (10%). In contrast to the report by Odeku et al. (15), Burkitt lymphoma was absent in this series, whereas the occurrence of glioma was frequent. As reported by others (5, 7, 8, 10, 14), the prostate and breast accounted for a significant percentage of metastasis in our study, 38.46% and 15.39%, respectively, in this subgroup of patients. In another 38.46%, the source of metastasis was uncertain.

Figure 4. Postoperative magnetic resonance imaging of the patient in **Figure 3** showing residual syringomyelia and absence of the tumor. The patient underwent C3–C5 laminectomy and gross total resection of the tumor.

Postoperatively, 52.5% of the patients remained neurologically the same, 45% improved neurologically, and 2.5% deteriorated. In the series by Maratos et al. (11), 65% of the patients remained the same. Avramov et al. (2) reported neurologic improvement in 45.08%; 43.44% remained the same, and 4.10% deteriorated. Bhatti et al. (3) reported 53%, 27%, and 16% for the same indices. Mortality rate in this study was 10.52%. The mean duration from surgery to death was 15.75 months ± 21.61. This compares to 13% reported by Bilsky et al. (4) and 7.3% reported by Avramov et al. (2).

CONCLUSIONS

A large percentage of our patients presented late in the course of the disease with most having motor deficit at presentation. The tumors were mostly in the thoracic region with more than half extradural in location. Gross total tumor excision was performed in 50.88% of the patients, and 17.86% had spinal stabilization. Metastasis was the most common histologic tumor type. The outcome was satisfactory in most cases with 97.5% improving neurologically or remaining neurologically the same. This study emphasizes the need for awareness of these lesions by health care workers and patients in sub-Saharan Africa because there may be more to back pain than "spondylosis."

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