Original Article

Pattern of Presentation and Surgical Management of Spine Tumors in Southeast Nigeria over a 10-Year Period

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Abstract

Background: Spine tumors could affect the bony elements and/or its neural contents. Clinical manifestations are underlined by their biological behaviors. **Aim:** This study aims to identify the pattern of presentation and surgical management of spine tumors in southeast Nigeria over a 10-year period. **Patients and Methods:** A retrospective analysis of patients who were managed surgically for the spine and spinal cord neoplastic lesions over a 10-year period. All patients had pre-and post-operative magnetic resonance imaging (MRI) and histological diagnosis. Relevant clinical, radiological, and histological data were extracted and analyzed using Statistical Package for the Social Sciences (SPSS) for windows version 21. **Results:** Four hundred and seventy-two spine procedures performed within the study period, 39 cases of histologically proven primary spinal cord tumors (PSCT) and non-PSCT were identified. These represented 8.3% of spine procedures. Seventeen were PSCT (3.6% of spine procedures), while 22 (4.7%) had non-PSCT, mean age for the PSCT group was 45 yrs and non-PSCT 59.5 years. A total of 56.5% of tumors are involved in the thoracic region, 43.7% in the cervical region. PSCT was likely to affect the cervical spine; while bony spine tumors, thoracic spine [odds ratio (OR) 4.9, *P* value 0.019]. A total of 84.6% of non-PSCT affected the bony spine, mainly the vertebral body. The histological result showed metastatic adenocarcinoma to be the most common tumor (33.3%). PSCT was likely to be benign than non-PSCT (*P* value < 0.00001). Gross total resection (GTR) was done in 100% of PSCT, and 50% in non-PSCT. Thirteen (40.6%) patients improved and 11 (34.4%) patients remained the same. **Conclusions:** Metastatic adenocarcinoma was the most common tumor of the spine. There was restricted ability at a GTR for non-PSCT compared to PSCT. Grossly 75% had improved/same neurological status, as such adjudged as a good outcome.

Keywords: *Metastatic, spinal cord, spine tumors, surgery*

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Introduction

Tumors of the spine are often considered from the perspective of their origin with the primary types native to the spine and its appendages while the secondary arising from elsewhere.[1] Irrespective of the type, there is the potential of neurological disability from the involvement of the spinal cord with its attendant consequences. The primary spinal cord tumors (PSCT) are rare and less common than the metastatic tumors. In terms of location, 55% are extradural, 40% are intradural extra-medullary, and 5% are intradural intramedullary.[2]

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Previous work by the authors showed that meningioma was the most common PSCT in our region.[3]

The spine is the most common site of bony metastasis and it is estimated that 10% or more of patients with malignancies will develop asymptomatic spinal

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metastasis.[4] Metastatic extradural lesions are most frequently present in the thoracic spine (60%) and less frequently in the lumbosacral (30%) or cervical (10%) regions.[5] The clinical presentation is determined by the location of these tumors and may include pain, motor dysfunction, sensory abnormalities, and sphincteric dysfunctions among others.[6] Magnetic resonance imaging (MRI) is central to the evaluation of patients as it helps in localization, classification into compartments, planning of treatment, and follow-up.[7] Surgical management of spinal metastasis has been unclear and has evolved significantly with the development of scoring systems to guide the surgeon such as that described by Tomita *et al*.[8] Where available, neurophysiologic monitoring has been shown to reduce the risk of surgical complications in surgery for spine tumors.[9]

This study aims to assess the trending pattern of presentation of tumors of the spine and the spinal cord, the pattern of neurosurgical management with the ultimate aim of improving services and outcomes.

Patients And Methods

This is a descriptive cross-sectional retrospective analysis of patients with primary and metastatic spinal neoplasms surgically managed in Memfys Hospital for Neurosurgery from January 8, 2006 to October 31, 2016. All patients had diagnostic pre- and post-MRI and surgical intervention. Additional computed tomography (CT) scans were used in further evaluation of all patients with suspected metastatic lesions. Data on demographic variables, clinical features, surgical approach, pathology, location, and association with syrinx were extracted.

For this study, PSCT was considered to be tumor arising from the spinal cord tissue and/or its coverings. All other tumors involving the bony and/or neural spine were considered as non-PSCT. The term spine tumor refers to both PSCTs and the non-PSCTs. The neurological status of patients was assessed using the Frankel grading system. Frankel A, B, and C were considered as 'Poor', while Frankel D and E were regarded as 'Good' neurological status.

Retrieved data were analyzed using Statistical Package for the Social Sciences (SPSS) for windows version 21. A P value <0.05 was considered statistically significant. Tumors without a histological diagnosis, traumatic hematomas, and osteophytic spurs were excluded from the analysis.

Results

General profile

Out of the 472 spine procedures performed within the study period, *39 cases* of histologically proven primary tumors and other tumors of the spine were identified. This represented 8.3% of spine procedures. Of these, 17 were PSCT (3.6% of spine procedures), while 22 (4.7%) patients had non-PSCT. The ages of patients ranged between 6 and 84 years (overall mean of 52.3 years) [Table 1]. There were 25 (64.1%) males and 14 (35.9%) females. No statistically significant difference in age was found between the two sex groups (P = 0.8112, *t*-test). The mean time (in days) to presentation for neurosurgical review was 8.96 days ± 11.5 (range 1–69).

In our study cohort, motor symptoms were seen in 69.2% of the patients, sensory deficits in 51.3%, and

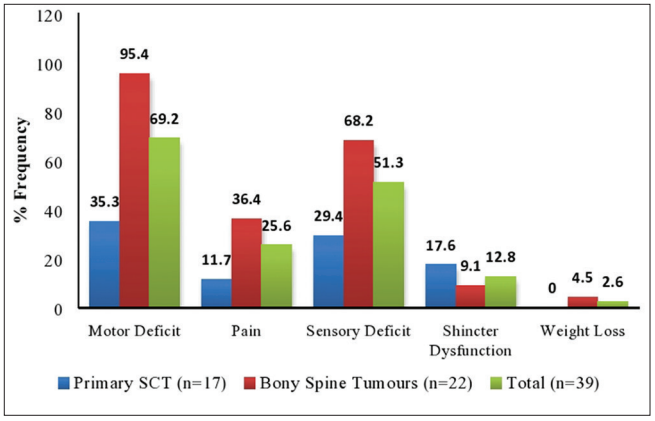

Figure 1: Distribution of clinical features

Table 1: Age Distribution of Patients

Age (Years)	Frequency	Percentage
0-10	1	2.0
11-20	2	6.1
21-30	1	4.1
31-40	7	18.4
41-50	4	10.2
51-60	8	22.4
61-70	9	24.5
71-80	5	12.2
Total	39	100

Table 2: Region of Spine Affected

	Primary SCT	Spine Tumours	Total	% Total
Occipito-Cervical	1	0	1	2.6
Cervical	10	5	15	38.5
Cervico-thoracic	0	1	1	2.6
Thoracic	5	12	17	43.6
Thoraco-Lumbar	1	3	4	10.3
Sacral	0	1	1	2.6
TOTAL	17	22	39	100

Table 3: Histological Diagnosis

Histology	Male	Female	Total (%)
Adenocarcinoma	12	1	13 (33.3)
Meningioma	4	8	12 (30.8)
Neuroblastoma	1	2	3 (7.7)
Pleomorphic Sarcoma	0	1	1 (2.6)
Multiple Myeloma	1	0	1 (2.6)
Ecchondroma	1	0	1 (2.6)
Osteosarcoma	1	0	1 (2.6)
Lymphoma	1	1	2 (5.1)
Schwannoma	1	0	1 (2.6)
MPNST[a]	1	0	1 (2.6)
Liposarcoma	1	0	1 (2.6)
Haemangioblastoma	0	1	1 (2.6)
Paraganglioma	1	0	1 (2.6)
TOTAL	25	14	39 (100.0)

[a]Malignant Peripheral Nerve Sheet Tumour

Table 4: Tumour Vs Neoplastic Nature

Tumour Type	Nature of Lesion		Total (%)
	Benign (%)	Malignant (%)	
PSCT	16 (94.1)	1 (4.5)	17 (43.6)
Non-PSCT	1 (5.9)	21 (95.5)	22 (56.4)
Total	17 (100.0)	22 (100.0)	39 (100.0)

Chi square 31.2904, p-value < 0.00001

Table 5:Surgical Methods of Treatment

Procedure	Other Spine Tumours (%)	Primary SCT (%)	Total (%)
Decompression + Biopsy	11 (50.0)	0 (0.0)	11 (28.2)
Laminectomy + GTRa	6 (27.3)	9 (53.0)	15 (38.5)
Laminectomy + GTR + Fixation	5 (22.7)	0 (0.0)	5 (12.8)
Hemilaminectomy + GTR	0 (0.0)	6 (35.0)	6 (15.4)
Sub-ligamentous Laminectomy +GTR	0 (0.0)	2 (12.0)	2 (5.1)
TOTAL	22 (100.0)	17 (100.0)	39 (100.0)

Table 6: Determinants of Post operative Functional Status at 6 Months

FACTORS	POST OP FRANKEL		COMMENT
	Good (%)	Poor (%)	
PRE-OP FRANKEL			
Good	10 (76.9)	3 (23.1)	
Poor	5 (26.3)	14 (73.7)	p-value 0.005, chi sq
Total	15(46.9)	17 (53.1)	
TUMOUR GRADE			
Benign	9 (75.0)	3 (25.0)	
Malignant	6 (30.0)	14 (70.0)	p-value 0.014, chi sq
Total	15(46.9)	17 (53.1)	

radicular pain in 25.6% [Figure 1] of the patients. Non-PSCT patients presented with deteriorated neurological status than PSCT patients. Tumors were located in the thoracic region in 56.5%, and the cervical region in 43.7%. Metastatic adenocarcinoma was the most common spine tumor (33.3%), followed closely by meningioma (30.8%). The duration of stay on admission varied from a minimum of 3 to 96 days (Mean 17.6 ± 14.3).

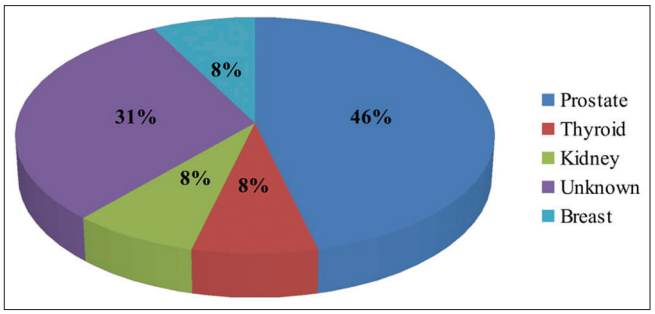

Figure 2: Sources of metastatic adenocarcinoma of the spine

Primary spinal cord umor profile

The mean age for the primary SCT group was 45 years. The male–female ratio was 1:1.1. The cervical spine was the most involved region 66.7% of cases [Table 2]. Motor deficits, sensory deficits, and pain were the most common clinical features at presentation [Figure 1].

About 94.1% were benign tumors. Meningioma was the most common PSCT (70.6%) with 57.1% (8/14) being females. Gross total resection (GTR) was achieved by the classical laminectomy procedure in 50% of PSCT.

Non-primary cord spinal umor (non-PSCT) profile

The age of patients with non-PSCT ranged from 6–88 years with a mean of 59.5 years. Male–female ratio was 3.4:1. Motor deficits, sensory deficits, and radicular pain were the most common presenting clinical features [Figure 1]. The onset of symptoms was insidious in 68% and sudden in 32% of patients. Most (70.6%) of these tumors involved the thoracic spine.

The non-PSCTs were located on the bony spine in 19 (86.4%) patients and extradural space in 13.6%. The most common location of bony spine tumors was the vertebral body (52.6%). Metastatic adenocarcinomas were the most common non-PSCT (59.1%) predominantly seen in males (92%). The most common primary site was the prostate [see Figure 2].

Comparison of PSCT and bony spine umors

The ratio of PSCT: non-PSCT was 1:1.3. The odd that a thoracic lesion was non-PSCT was 4.9 times that of PSCT [odds ratio (OR) 4.9, P = 0.019]. The same odd existed in relation to the cervical spine and PSCT.

There was a significant association between tumor type and their neoplastic nature, with PSCT it is

likely to be benign and the non-PSCT likely to be malignant ($P < 0.00001$) [Table 4]. A less extensive bony approach (hemilaminectomy) was used in 35% of PSCT [Table 3]. All the PSCTs had a GTR. Non-PSCT had GTR in 50% of cases, and the remaining 50% had debulking only [Table 5]. Five (22.5%) patients of those with non-PSCTs required fixation of the spine in addition to tumor resection. No fixation was required for the PSCT.

Follow-up functional assessment at 6 months was available in 32 patients. Their respective Frankel grades A, B, C, D, and E were 28.1%, 9.4%, 15.6%, 18.8%, and 28.1%. Clinical improvement was noticed in 13 (40.6%) patients, 11 (34.4%) patients remained clinically the same, while 8 (25%) patients deteriorated. Determinants of postoperative functional status are shown in Table 6.

Discussion

Tumors of the spine affected age groups ranging from pediatrics to geriatrics (6–84 years) among the study cohorts. Patients with PSCTs were a decade younger than those with other tumors involving the spine. This difference was however not statistically significant between the groups ($P = 0.8112$, *t test*). Spine tumors had a male predilection, with a male–female ratio of 1.8:1. The finding was consistent with epidemiological reports from Iran where male predilection and a decade difference in mean age between PSCT and metastatic tumors were reported by Moein *et al*.[10] Adeolu *et al*. also reported a male preponderance among their cohorts in Ibadan, southwest Nigeria.[11] These tumors mainly involved the thoracic region. The bony spine lesions were 4.9 times more likely to affect the thoracic spine than PSCT and this was statistically significant among our cohorts. (OR 4.9, *P* value is 0.019). The same odd exists for PSCT having a predilection to the cervical spine.

Of the 22 non-PSCTs, 13 (59.1%) were metastatic in nature and histologically identified as adenocarcinoma. The non-PSCTs were located on the bony spine in 19 (86.4%) patients and extradural space in 13.6%. The vertebral body was the most common site of bony spine tumors and was affected in 77.9% of cases. Similar findings have been reported for metastatic disease that involved the vertebral bodies (80%) more often than the posterior elements (20%). This has been attributed to the chief repository role of cancellous bone and their extensive arterial and venous systems.[12]

When analyzed in the context of histology, metastatic adenocarcinoma was the most common tumor (33.3%), followed by meningioma (30.8%). These histological findings were in tandem with those reported by Adeolu *et al*. who also found metastasis and meningioma to be the most common histologically diagnosed spine tumors in Ibadan, southwest Nigeria.[11] We believe that the proportion of metastatic tumors could be higher than this because the majority of patients with metastatic disease present mainly to the physician managing the primary tumor and not the neurosurgeon.

The primary sites in 4 of the 13 (31%) patients with metastatic tumors were not identified. Metastatic melanoma of unknown primary (MUP) was defined as a biopsy-proven histological malignancy demonstrating cancer that could not have originated at the biopsy site, and for which no identifiable primary site of the tumor could be found. Our proportion falls within the range of 0.4% to 38% quoted in the literature.[13] Prostate was the most common primary site for metastatic adenocarcinoma accounting for 46% among our patients. This is not surprising given the male preponderance in the study and corroborates with findings among patients with metastatic compression by Popoola *et al*. in Lagos, Nigeria.[14]

Zileli and his co-workers found complete tumor resection to be the best surgical strategy for spine tumors and recommended it whenever possible. However, they cautioned that it may not be feasible in every case.[15] In 50% of our patients with non-PSCTs, decompression and biopsy alone were done, while all patients with PSCT had a GTR of tumor. This was due to the poor performance status in some of the patients with the spine tumors, a great number of which were having palliative care. Though some other patients had fixation done, it is our principle to put the overall interest of the patient first. This principle has been poetically captured in a comment by AtulGoel; "We conclude by saying that humility must guide neurosurgical techniques, and a surgeon must not give in to, what the great physicist and the 'Father of the Atom bomb', Robert Oppenheimer, called the lure of "the technically sweet."[16]

From our findings, 25% of patients deteriorated at 6 months following surgery. This figure is higher than that reported by Adeolu *et al*.[11] We attribute this partly to the higher rate of metastatic lesions among our cohorts (33.3%) compared to 23.21% in their report. In addition, there were higher cases of malignant primary tumours in our study which could add to the burden of disease.

A recent study has shown that percutaneous surgery may allow for rapid improvement in the quality of life and walking ability for patients with Thoraco-lumbar instability due to spine metastases.[17]

Conclusions

Non-PSCTs are the most common types of spine tumors in our locality. While these have a predilection for the thoracic spine, the PSCT have a predilection to the cervical spine. Metastasis is the most common histologically diagnosed spine tumor. Surgical treatment ranged from bony decompression and simple biopsy to GTR with/without fixation as indicated. There is a restricted ability to do a GTR for non-PSCTs compared to PSCTs. Improvement in the neurological outcome and/or maintenance of pre-op Frankel grading was recorded in 75% of the patients at 6 months follow- up. Preoperative neurological status and the higher cases of malignant tumors grossly influenced the neurological outcome.

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Conflicts of interest

There are no conflicts of interest.

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