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Functional recovery following surgery of spinal tumours.

Riyadh Ahmed Abid M.B.Ch.B., F.I.B.M.S. Neurosurgery. The neurosurgical hospital.

Ahmed Rhadi Obaid M.B.Ch.B., F.I.B.M.S. Neurosurgery. The neurosurgical hospital.

Muhammed Hameed Faeadh M.B.Ch.B., F.I.B.M.S. Neurosurgery. Assistant prof. In Aliraqia University. College of medicine. Department of surgery.

ABSTRACT **objectives:** The Goal of our study was to determine the functional recovery following spinal surgery for patients of spinal tumors & to evaluate the positive & negative factors affecting the functional recovery. **Methods:** A retrospective study of 40 patients between 2010-2016 was performed in Al-Shaek Zaed teaching hospital for neurosurgical specialization & in neurosurgical hospital. Patient age, sex, presentation, tumor types, locations, type of surgery & surgical outcome were evaluated. **Results:** There were 15 men and 25 women. Men presented at a younger age than women. Mean duration of symptoms prior to diagnosis was 1-3 months. Schwannomas had the longest mean duration of symptoms (6 months), followed by meningiomas (5 months), and ependymomas (2 months). About 42% patients had residual focal deficits on long term follow-up. **Conclusions:** Earlier Surgery for spinal tumor produce significant and dramatic improvement in great majority of patients, especialy in extradural extra-medullary benign tumors.

KEYWORDS : spinal tumours. Functional recovery.

Introduction:

Spinal tumors are neoplasms located in the spinal cord & vertebrae. Spinal tumors account for only approximately 5-15% of the nervous system neoplasms(1,2). Primary spinal cord tumors account for 2-4% of all primary central nervous system (CNS) tumors, Depending on their location, the spinal cord tumors can be:

- Extradural - outside the dura mater lining.
- Intradural.
- Intramedullary - inside the spinal cord within the spinal parenchyma.
- Extramedullary- inside the dura, but outside the spinal cord parenchyma.

One-third of spinal tumors are located in the intramedullary compartment(4,5,6) Intradural extramedullary spinal cord tumors (IESCT) constitute approximately two thirds of these tumors.(2,3) Extradural tumors are usually metastatic and most often arise in the vertebral bodies. Metastatic lesions can cause spinal cord compression either by intradural invasion or, more commonly, by epidural growth that results in extrinsic spinal cord or cauda equina compression.

Pathology: Extradural tumors are mostly metastases from primary cancers elsewhere (breast, prostate & lung cancer).(7) Intradural tumours can be intramedullary (within the spinal parenchyma) or extramedullary (within the dura, but outside the spinal parenchyma). Extramedullary tumours are more common than intramedullary tumours. Common extramedullary tumours include meningiomas, schwannomas, extramedullary ependymomas, haemangioblastomas, while intramedullary tumours include astrocytomas and intramedullary ependymomas.(8)

Symptoms:Pain is the most common symptom at presentation.(8) The symptoms seen are due to spinal nerve compression and weakening of the vertebral structure. Incontinence and decreased sensitivity in the saddle area (buttocks) are warning signs of spinal cord compression by the tumor. Other symptoms include lower extremity weakness, sensory loss, numbness in hands and legs and rapid onset paralysis. Spinal cord compression is commonly found in patients with metastatic malignancy.(9) Referred pain, eg, to the shoulder or neck, is also common with spinal metastases.(10) The spine is a common metastatic site for prostate cancer, breast cancer, and lung cancer.(11,12) Rapid intervention of malignant spinal tumors is key to maintaining quality of life in patients.(13)

Diagnosis: spinal MRI, CT scan & bone scanning are used for diagnostic purposes. This assesses tumors relationship with the spinal cord and the risk of cord compression.(14)

Treatment: Corticosteroids)(15) may be administered if there is evidence of spinal cord compression. These tend to reduce the inflammatory reaction & decrease the volume of the mass impinging on the spinal cord. Radiotherapy may be administered to malignant tumors. Surgery goals include histologic diagnosis, tumor local control or oncological cure, pain relief, spinal cord decompression and restoration of neurological function, restoration of spine stability, and deformity rectification.(15)

Patients & methods:

A retrospective study of 40 surgical patients were operated between 2010 & 2016. We compared patient age, sex, symptoms (severity & duration), tumor characteristics (anatomic & pathologic), postoperative surgical outcomes. Surgical intervention was indicated by a neurodeficit & radiographic findings. The neuroimaging of choice was contrast-enhanced MRI. The surgical procedures were post approach laminectomy at one or multiple levels & dural opening aiming total excision of the tumour. Surgical outcomes were scored at 6 month and then at the mean follow-up period. The mean follow-up was calculated from the interval between surgery & the last complete clinical examination in the patient chart. Our criteria in following up of our patient were scored according to the modified criteria of Odom et al.(16)

Modified Criteria of Odom, et al.(16) .

Results:

Table 1: distribution of SCT according to the age of the patient

	Type	Child<14 yrs	Adult<60 yrs	Elder>60 yrs
Intradural intramedullary (ID IM)	ependymoma	0	7	0

	astrocytoma	1	1	2
	lipoma	1	1	0
Intradural extratramedullary (ID EM)	meningioma	0	8	0
	neurofibroma	0	10	0
Extradural (ED)		1	4	4
Total		3 (7.5%)	31 (77.5%)	6 (15%)

Most of patients (77.5%) were presenting between the age of 15 & 60 years, were only 3 patients were below 15 years & 6 patients (15%) were more than 60 years.

Table 2: distribution of SCT according to sex of patients

	Type	Male	female
ID IM	ependymoma	3	5
	astrocytoma	2	2
	lipoma	1	1
ID EM	meningioma	3	5
	neurofibroma	4	7
ED		2	5
Total		15 (37.5%)	25 (62.5%)

In this study, 15 patients were males & 25 patients were females. There was evidence of predominance of meningioma, neurofibroma, ependymoma & extra-dural tumors in female & equal sex incidence of lipoma & astrocytoma.

Table 3: Distribution of SCT according to time of diagnosis

	Type	Early Dx.& Rx. (< 2 months)	Late Dx. &Rx. (>2 months)
ID IM	ependymoma	1	6
	astrocytoma	1	3
	lipoma	0	2
ID EM	meningioma	5	3
	neurofibroma	8	2
ED		2	7
Total		17 (42.5%)	23 (57.5%)

The above table demonstrates that 42.5% of patients diagnosed early & 57.5% of patients diagnosed later on.

Table 4: distribution of SCT according to the level of tumours

	Type	Cervical	Thoracic	Lumbosacral
ID IM	ependymoma	0	4	4
	astrocytoma	3	1	0
	lipoma	1	0	1
ID EM	meningioma	5	3	0
	neurofibroma	2	4	3
ED		0	7	2
Total		11 (27.5%)	19 (47.5%)	10 (25%)

We have 27.5% of patient had cervical level tumors, 47.5% thoracic level & 25% are lumbar.

Table 5: surgical outcome of SCT postoperatively

	Type	Excellent	Good	Fair	Poor
ID IM	ependymoma	0	2	2	3
	astrocytoma	0	0	1	3
	lipoma	0	2	0	0
IDEM	meningioma	4	3	1	0
	neurofibroma	7	3	0	0
ED		0	2	2	5
Total		11 (27.5%)	12 (30%)	6 (15%)	11 (27.5%)

The prognosis was excellent in 27.5%, good in 30%, fair in 15% & poor in 27.5%. Most of the intradural extramedullary tumours have good to excellent outcome & most of the intradural intramedullary tumours & metastatic extradural tumours have fair to poor outcome.

Table 6: relaion of time of diagnosis to surgical outcome of SCT postoperatively

	Type	Early Dx.& Rx. (< 2 months)	Excellent & good	Fair & poor	Late Dx. &Rx. (>2 months)	Excellent & good	Fair & poor
ID IM	ependymoma	1	1	0	6	1	5
	astrocytoma	1	0	1	3	0	3
	lipoma	0	0	0	2	2	0
ID EM	meningioma	5	5	0	3	2	1
	neurofibroma	8	8	0	2	2	0
ED		2	1	1	7	1	6
Total		17 (42.5%)	15	2	23 (57.5%)	8	15

This table demonstrates that 15 of 17 early diagnosed patients had good & excellent functional recovery, & 2 had poor recovery. In the late diagnosis & treatment, 8 of 23 patients had good & excellent recovery, & 15 of 23 patients had poor recovery.

Discussion

The treatment of choice for spinal cord tumour is surgical removal of the lesion, provided that we preserve the anatomy & neurological function of spinal cord. Microsurgical technique & instrumentations give us good surgical outcomes with less morbidity and mortality(2,3,13,17) Excellent & good functional recovery following surgical intervention in our study can be achieved with early diagnosis & early intervension especialy in Intradural extramedullary tumours. Bad prognosis related to metastatic spinal tumours, intramedullary tumours, delayed diagnosis with late surgical intervention & in elder age group. These results agree with those of S. Peter Stawicki & John J. Guarnaschelli, with the majority of clinical improvement noted either immediately or within 6 months of the operative intervention, with less notable clinical change after this initial period.(2) Hufana V. et al, & Welch. et al, studies reported that the duration of preoperative symptoms appears to correlate with postoperative recovery & that successful complete microsurgical excision is of utmost importance.(2,10,18) Approximately 42% of patients in this study experienced residual focal deficits. Poor functional recovery was attributed to delayed diagnosis & surgery & to metastatic extradural tumours with poor underlying systemic disease. Most of the cases of metastatic extradural tumours occur in elder age group, in the lower thoracic vertebrae, with poor functional neurological outcome postoperatively because of delayed diagnosis & uncontrolled primary disease. These results agreed the study of Sarah Douglas et al. which Found that, in metastatic spinal tumors a rapid development of motor deficits was associated with a worse functional outcome & could be explained by the fact that a rapid decline in motor function was caused by disruption of the arterial blood flow resulting in spinal cord infarction.(19,20,21) Poor recovery also occurs in those patients with intradural intramedullary tumours. Ependymomas with delayed diagnosis after 3 months had poor functional recovery. Myxopapillary ependymomas constitute 50% of ependymoma in this study with male:female ratio of 3:5. Wippold FJ. et al. series reported twice as many in men as women of spinal cord ependymomas.(22) John W. Henson found that the well-

circumscribed, encapsulated nature of spinal cord ependymomas often permits an aggressive surgical resection, even when the lesions extend over substantial segments of the cord.(23) Thus, a gross total resection should be the primary treatment goal for patients with this tumor. Tumors should be removed en bloc, in order to decrease the theoretical risk of spreading tumor cells via the CSF pathways.(23) Gross total resection of High-grade ependymomas is more difficult & increasing the risk of worsened neurological function. Tumor associated syringomyelia should be decompressed if they appear to be symptomatic.(23)

Low-grade ependymomas of the spinal cord are usually slowly growing lesions with little tendency for anaplastic progression to higher grades. Recurrence is almost always due to tumor growth at the original tumor site, although the possibility of simultaneous tumor dissemination throughout the neuraxis should be also considered.(24) Prognostic factors include histological grade and postoperative neurological function. Overall survival rates of patients with low-grade ependymomas of the spinal cord are in the range of 85% 5-year survival.(24) As in our study, John W. Henson institute that the survival rates are higher in patients with myxopapillary ependymomas and are significantly lower in patients with anaplastic ependymomas.(23) Astrocytomas in our study distributed equally between male & female, but more common in elder age group, in the cervical region; & in 75% of cases, diagnosis & surgical treatment was later on & the prognosis was poor.

The best results of spinal tumor surgery in our & all other studies occur in patients with intradural extramedullary tumours which are neurofibroma & meningioma. Both Schwannomas & meningiomas tended to occur more common in adult women. Reported frequencies of schwannomas vary from 43% to 67% in Hufana V., Prevedello DM., el-Mahdy W. & Garrido P. Studies.(2,13,25,26) Schwannomas tend to produce localized pain, radiculopathy, and cauda equina syndrome. In this study, meningiomas are localised to cervical region in 62% & in 38% to thoracic region. Prevedello DM., Gelabert-Gonzalez M., Fromme K. & Garcia-Allut A. study demonstrated that 80% of meningioma are localized to the thoracic region.(13,27,28,29) In this study 62% of patients with meningiomas are women who tend to be adult patients. In comparism, the studies of Prevedello DM., Gelabert-Gonzalez M. & Fromme K. demonstrated that 75%-85% of meningioma occurs in women of older age group.(13,27,28) In our study the bad functional recovery was related to extra-dural malignant lesion & intradural intramedullary tumor in older age groups. Prevedello DM, et al. describe higher morbidity associated with tumor located in the thoracic region,(13) & CG Patil, et al. shown that advanced age and multiple comorbidities are risk factors that predict adverse outcome.(30)

Conclusions: Early surgery for spinal tumors with complete tumor removal, is a safe and effective option, provided that no neurological deficit is produced by the intervention of good experienced surgeon. Site, duration of pathology, tumor specific and anatomic levels are clinically significant prognostic parameters when approaching spinal tumors.

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