

# SURGICAL OUTCOME OF CERVICAL CORD TUMORS

By

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## ABSTRACT

**Background:** Spinal cord tumors represent 10% to 15% of central nervous system (CNS) neoplasms. In adults, two thirds of these tumors are extra medullary and the remaining third are intramedullary.

**Objective:** To outline the final outcome of cervical cord tumor surgeries.

**Patients and Methods:** This was a study over a period of two years from January 2018 to January 2020 at Al-Azhar University Hospital and Eldoah Hospital of 30 patients with cervical cord tumors with primary or secondary origin subjected to surgery and follow up of patients, the neurological status before surgery and immediate post-operative examination were assessed.

**Results:** Surgical morbidities were significant more frequent in unimproved patients. There was a significant correlation between the pre-operative state and the final functional outcome. The better the preoperative state the better was the outcome.

**Conclusion:** The cervical cord tumors can be treated safely and effectively by surgery. Total resection was the essential aim before surgery. Preoperative neurological state, pathological type, pathological grades, and degree of resection were the most important factors that affect the final outcome.

**Key words:** Surgical Outcome, Cervical Cord Tumors.

## INTRODUCTION

Primary spinal cord tumors are 10 times less common than their cranial counterparts, although they are histopathologically similar. Spine tumors are historically classified as extradural, intradural extramedullary, and intramedullary. Extradural tumors are the most common spinal tumors, are usually of metastatic origin. Gliomas make up 80% of all intramedullary tumors. Metastatic intramedullary tumors are rare

but present in 2% of all intramedullary tumors (*Ahmed et al., 2014*).

Presenting signs and symptoms vary depending on the spinal levels involved, but typically include pain, sensory changes, motor weakness, ataxia, and autonomic dysfunction. Various scales such as the modified McCormick scale, have been used to grade pre- and postoperative functional status (*Treadway, 2014*).

The treatment goal is gross total resection (GTR) where possible while

minimizing neurological injury. Low-grade astrocytoma in particular has been reported to have excellent results with gross total resection, although the evidence for surgery in higher-grade tumors remains controversial (*Bostrom et al., 2014*).

Many variables influence the prognosis of cord tumor, but the most predictive of these variables is tumor histology. Histology is often predictive of resectability of a tumor which, in turn, impacts the relationship between the extent of surgical resection and the risk of tumor recurrence (*Sung et al., 2013*).

**The aim of this study was to** evaluate surgical outcome of cervical cord tumor.

#### PATIENTS AND METHODS

The study had been carried out at Al-Azhar University Hospital and Eldoah Hospital, over a period of two years from January 2018 to January 2020 of patients with cervical cord tumors subjected to surgery and follow up of patients.

**Inclusion criteria:** Patients with cervical cord tumors with primary or secondary origin.

**Exclusion criteria:** Cases with vertebral bony tumors without cord compression and cases with vascular lesion in cord.

Patients had been subjected to general clinical and radiological examination.

All patients included gave written consents to be eligible in the study.

**Pre-operative neurologic state:** Initial presenting symptoms and extent of tumor resection were reviewed to analyze prognostic factors.

Initial presenting symptoms were divided into pain, sensory change and motor weakness.

Extent of tumor removals was classified as total resection (TR) and subtotal resection (STR). The TR was defined as complete removal of tumor by microscopic surgical finding and postoperative MRI finding. All patients had taken magnetic resonance imaging (MRI) pre- and post-operatively. The patients have undergone standard microscopic operations using posterior approach.

Preoperative assessment was according to Karnofsky performance scale index (KPS) (*Péus et al. 2013*), and modified Mc Cormick scale (*Schneider et al., 2013*).

Post-operative improvement assessment was for Spasticity, hyperreflexia, positive, hoffman's sign, neck pain, limb weakness, limb paresthesia and gait imbalance.

Surgical morbidity and mortality was for CSF leak, lower CN deficit, quadriparesis, hemiparesis, paraplegia, hemiplegia.

**Administrative considerations:** An Official permission was obtained from Al-Azhahr University Hospital and Eldoah Hospital. An official permission was obtained from the Ethical Committee of Faculty of Medicine.

**Statistical Analysis:** Data entry, processing and statistical analysis was carried out using using SPSS version 20(Statistical Package for the Social Sciences). Data were presented as frequency and percentage and compared

by Chi square test. P less than 0.05 was considered significant.

**RESULTS**

The majority of the patients aged 31-40 years and regarding sex, 14 (46.66%) of patients were males, and 16 (53.33%) were females.

**Table (1): Demographic distribution of the all patients**

Parameters		All patients (n=30)	
		N	%
Age (years)	0 – 10	0	0
	21 – 30	2	6.66
	31 – 40	14	46.66
	41 – 50	8	26.66
	51 – 60	2	6.66
	61 – 70	4	13.33
Sex	Male	14	46.66

Regarding tumor type, meningioma was the most prevalent type by 73.33%. The majority of the patients 66.66% had total resection and partial resection was done in 33.33% of patients.

**Table (2): Tumor types and resection grade in all patients**

Parameters		All patients (n=30)	
		No	%
Tumor type	Astrocytoma	4	13.33
	Ependymoma	4	13.33
	Meningioma	22	73.33
	Other	0	0
Resection grade	Total resection	20	66.66
	Partial resection	10	33.33
	Biopsy	0	0

Twenty-two patients (73.3%) improved postoperatively.

**Table (3): Postoperative improvement status of the studied patients**

parameter	All patients (n=30)	
	Yes	No
Postoperative Improvement	22	73.33
	8	26.66

Preoperative assessment parameters of the studied patients showed that limb weakness was the most parameters to be presented with 73.33% of cases, followed by dysthesia (66.66%), neck pain (60%), hyperreflexia (53.33%), and occipital headache (53.33%). The least presentation was incontinence (6.66%), then spasticity (13.33%).

**Table (4): Preoperative assessment parameters of the studied patients**

Parameters	All patients (n=30)	
	N	%
Spasticity	4	13.33
Hyperreflexia	16	53.33
Positive Babinski sign	8	26.66
Positive Hoffman's sign	8	26.66
Neck pain	18	60
Urinary/stool incontinence	2	6.66
Limb weakness	22	73.33
Dysesthesia	20	66.66
Gait imbalance	8	26.66
Occipital headache	16	53.33

There were no complications in 20 (about 66.66%) of cases, while dysthesia and quadriparesis were 6 (20%). The least

complication was paraplegia with 4 (13.33%) cases and death in only one case.

**Table (5): Postoperative complication of the studied patients**

Parameters	All patients (n=30)	
	N	%
No complications	20	66.66
CSF leak	0	0
Dysthesia	6	20
Quadriparesis	6	20
Paraplegia	4	13.33
Death	1	3.33

There was a statistically significant relation between improvement with age (41-50) with P-value= 0.046, while there

was no statistically significant relation between improvement and sex.

**Table (6): Demographic data of the studied patients according to improvement status**

Parameters		Cases	Improved (n=22)	Not Improved (n=8)	P-value
Age (years)	0 – 10 (n=0)		0 (0.0%)	0 (0.0%)	0 (0.0%)
	21 – 30 (n=2)		2 (9.1%)	0 (0.0%)	0.377
	31 – 40 (n=14)		8 (36.4%)	6 (75%)	0.061
	41 – 50 (n=8)		8 (36.4%)	0 (0.0%)	0.046
	51 – 60 (n=2)		2 (9.1%)	0 (0.0%)	0.377
	61 – 70 (n=4)		2 (9.1%)	2 (25%)	0.257
Sex	Male (n=14)		10 (45.5%)	4 (50%)	0.825
	Female (n=16)		12 (54.5%)	4 (50%)	

There was a statistically significant relation between improvement with tumor type, spasticity, positive Hoffman's sign,

gait imbalance, hyperreflexia, and Limb weakness.

**Table (7): Clinical data of the studied patients according to improvement status**

Cases Parameters		Improvement (n=22)	Not Improvement (n=8)	P-value
Tumor Type	Astrocytoma (n=4)	0 (0.0%)	4 (50%)	<0.001
	Ependymoma (n=4)	0 (0.0%)	4 (50%)	<0.001
	Meningioma (n=22)	22 (100%)	0 (0.0%)	<0.001
	Other (n=0)	0 (0.0%)	0 (0.0%)	NA
Resection grade	Total resection (n=20)	15 (68.2%)	5 (62.5%)	0.771
	Partial resection (n=10)	7 (31.8%)	3 (37.5%)	
Spasticity		0 (0.0%)	4 (50%)	<0.001
Hyperreflexia		8 (36.4%)	8 (100%)	0.002
Positive Hoffman's sign		2 (9.1%)	6 (75%)	<0.001
Neck pain		14 (63.6%)	4 (50%)	0.500
Limb weakness		14 (63.6%)	8 (100%)	0.046
Dysthesia		14 (63.6%)	6 (75%)	0.559
Gait imbalance		2 (9.1%)	6 (75%)	<0.001

There was a statistically significant relation between improvement with paraplegia and quadriparesis.

**Table (8): Surgical morbidity incidences of the studied patients according to improvement status**

Cases Parameters	Improvement (n=22)	Not Improvement (n=8)	P-value
Quadriparesis	2 (9.1%)	4 (50%)	0.013
Paraplegia	0 (0.0%)	4 (50%)	<0.001

**DISCUSSION**

Early clinical manifestations of cervical cord tumors are often untypical nerve root stimulation and compression symptoms, which are easily misdiagnosed as occipital neuralgia, cervical spondylosis, or scapulohumeral periarthritis, among others. However, some patients are not diagnosed until experiencing limb paralysis and bowel dysfunction. Sensory disturbances are the most common symptom during the course of progression, which can be characterized by the numbness of limbs, occipital or facial area, chills, girdle sensation and unstable walking. Furthermore, such

tumors can oppress the medulla oblongata structure and cause severe respiratory dysfunction compared with spinal cord tumors at other place, cervical spinal cord tumors make for more serious neurological deficits and surgical challenges. The severe extremity movement and respiration deterioration can threaten life. Operative results improve significantly owing to developments of radiological diagnosis technology and advances of microneurosurgical operations Wang *et al.* (2018).

In our study, as regard demographic distribution of the all patients, the

majority of the patients aged 41 - 50 years and regarding sex, 47% of patients were males and 53% were females.

In the study of *Babu et al. (2014)*, to study Surgical outcome of cervical and intra medullary tumors, the mean age of patients was  $42.6 \pm 8.42$  years and male: female ratio was 54%: 46%.

In the study of *Wahdan et al. (2014)*, prognostic factors of surgery for Cervical Cord Tumors, there were 38 males and 23 females with a percentage of 62.3 and 37.7 respectively.

In our study, as regarding preoperative assessment parameters of the studied patients, limb weakness was the most parameter to be presented with 73 % of cases, followed by dysthesia (66%), neck pain (60%), hyperreflexia (53%), and occipital headache (53%). The least presentation was incontinence (7%), then spasticity (13%).

In the study of *Fathy et al. (2019)*, the most common presenting symptom was back pain (87.5%), followed by sensory changes (56.25%) and then motor weakness (n = 6, 37.5%).

In the study of *Bansal et al. (2013)* pain was the most frequent sensory symptom (50.7%). Urinary incontinence was the most common autonomic symptom (31%) there was no difference in symptomatology among patients with different tumor types as pain and weakness were most common symptoms in all tumor groups.

In our study, regarding tumor type, meningioma was the most prevalent type by 73.3%. The majority of the patients (67%) had total resection and partial resection was done in 33% of patients.

In the study of *Wang et al. (2018)*, the neurilemmoma (also known as schwannoma) was the most common type (45.10%), followed by, meningioma (11.76%), neurofibroma (11.76%), ganglion cell neurofibroma (11.76%), hemangioma (5.88%), ependymoma (WHO grade I) (3.92%), Astrocytoma (WHO grade II) (3.92%), and 2% others. total resection in 52.94% and partial resection in 47.06% patients.

In the study of *Jaiswal and Mittal (2014)* the most frequent tumour was ependymoma (41.5%) and followed by astrocytoma (30.1%).

In the study of *Bakhshi et al. (2016)*, the most common histological diagnosis was ependymoma (60%) and GTR in 30 patients (69.8%).

In our study, as regarding to improvement and non-improvement of the studied patient's post-operative, 73.3% improved postoperatively, while 26.7% didn't improve.

In the study of *Boström et al. (2014)*, to study outcome in adult intramedullary spinal cord tumors, the proportion of localization in cervical region was 33%. Surgery-related morbidity with worsening postoperative symptoms occurred immediately 18.6%.

In the study of *Lee et al. (2014)*, the neurological states at last follow-up were improved in 23.2%, unchanged in 47 (68.1%), aggravated in 6 (8.7%). In all patients, the functional outcomes were good in 75.4%, fair in 10 (14.5%) and poor in 7 (10.1%)

In our study, as regarding surgical morbidity and mortality incidences of the studied patients, there were no

complications in about 66% of cases while dyesthesia and quadripareisis were 20% cases each. The least complication was paraplegia 13% of cases and death in only one case.

In the study of *Fathy et al. (2019)*, Common complications were cerebrospinal fluid leak occurred in two cases, in which dural grafts were used, post-operative hematoma in one case, tumor recurrence in two cases at last follow-up, and UTI in one case.

In the study of *Xiao et al. (2015)*, postoperative Surgical site infection (16%) and syrinx formation (16%) were the most common complications then cerebrospinal fluid leak (11%), deep vein thrombosis (11%) and epidural hematoma (4%).

In our study, as regarding regression analysis of the improvement status between improvement and non-improvement groups, No significant difference between the groups regarding Demographic data, Clinical data. But surgical morbidities were significant more frequent in unimproved patients.

In the study of *Wahdan et al., (2014)*, the pathological type of the tumor was strongly correlated with significant value to the outcome and good postoperative state of the patient. Best outcome was with extramedullary tumours specially neurofibroma and meningioma (patients improved 83% for both) followed by Schwannoma with 69%, then intramedullary tumors like ependymoma 36% and astrocytoma 33.4%.

In the study *Zhixu et al. (2017)*, this study showed that good postoperative outcomes achieved in the majority of

patients undergoing intradural spinal tumor excision, with 92% of patients reporting improved neurologic outcomes post-surgery. Also showed that complete excision of the tumor is associated with improved outcomes.

## CONCLUSION

Surgical management of cervical cord tumors markedly improved, but deterioration and complication rates were still high.

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## تقييم العلاج الجراحي لأورام الحبل الشوكي العنقي رمضان عبدالعزيز رمضان، عبدالكافي شرف الدين إبراهيم، محمد حسن منصور

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**خلفية البحث:** أورام الحبل الشوكي تمثل 10% الي 15% من أورام الجهاز العصبي المركزي وتلثي هذه الأورام تكون داخل الأم الجافية خارج نخاع الحبل الشوكي والتلت الآخر في نخاع الحبل الشوكي.

**الهدف من البحث:** تقييم النتيجة الجراحية لأورام الحبل الشوكي العنقي.

**المرضي وطرق البحث:** هذه دراسة على مدى عامين من شهر يناير 2018 الي شهر يناير 2020 في مستشفيات جامعة الأزهر ومستشفى الدعاة علي ثلاثين من المرضي اللذين يعانون من أورام الحبل الشوكي العنقي من أورم أولية أو ثانوية وخضعوا لعملية جراحية وتمت متابعة المرضي بعد الجراحة وكان قد تم إستبعاد المرضي اللذين يعانون من أورام الفقرات العنقية أو الوحومات الشريانية.

**نتائج البحث:** كانت المراضة الجراحية أكثر حدوثا في المرضي اللذين لم يتحسنوا بعد الجراحة و وجدت علاقة قوية بين الحالة الوظيفية للمرضي قبل الجراحة والتقييم النهائي للمرضي بعد الجراحة حيث كان من هو حالته أفضل وظيفيا قبل الجراحة كان هو أفضل تحسنا بعد الجراحة.

**الإستنتاج:** العلاج الجراحي لأورام الحبل الشوكي أصبح جيدا وأكثر فاعلية كانت أكثر العوامل التي أثرت علي التقييم النهائي للمرضي بعد الجراحة هي حالة المريض الوظيفية العصبية قبل الجراحة ونوع ودرجة التحليل النسيجي للورم ودرجة استئصال الورم اثناء الجراحة.

**الكلمات الدالة:** التقييم الجراحي، أورام الحبل الشوكي.