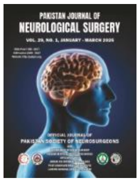

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Original Research

# Frequency of Functional Outcome Among Patients with Spinal Tumor Visiting Tertiary Care Hospital

**Abdul Rauf Memon, Aurangzeb Kalhoro**

Department of Neurosurgery, Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro – Pakistan

## ABSTRACT

**Objective:** To determine the frequency of functional outcomes among patients with spinal tumors.

**Materials and Methods:** This study was conducted at the neurological surgery department, Liaquat University of Medical and Health Sciences, Jamshoro and it was a descriptive study. A total of 145 patients presenting with spinal cord tumors were admitted through the outpatient department (OPD) and subsequently underwent surgical procedures. The diagnosis was primarily based on MRI findings, and the Frankel scale was used to assess neurological progress.

**Results:** The current study included 145 patients in total, with 65.5% of them being male. The majority (75.2%) were older than 60, whereas the mean age was 65.65±6.43 years. In contrast to the 15.9% of tumors in the cervical spine, 73.8% in the thoracic spine, and 10.3% in the lumbar spine, there were 13.8% intramedullary and 86.2% extramedullary tumors. Eight percent of patients required dorsal stabilization, 9.7% had surgical issues, 11.7% had medical difficulties, 66.2% required perioperative corticosteroid administration, and 11% required neuromonitoring. Upon admission, 11.7% had radiating pain, 34.5% had back discomfort, 82.1% had sensory deficiency, and 71% had bowel/bladder dysfunction. The mean McCormick score was 3.17±0.67 and 2.56±0.92 on admission and discharge, respectively whereas the mean KPS was 49.42±11.78 and 49.42±11.78 receptively. There were 40% of patients with unfavorable and 60% with favorable outcomes.

**Conclusion:** Early diagnosis with minimal symptoms leads to better outcomes, whereas delayed presentation and significant neurological deficits are associated with poorer prognosis.

**Keywords:** Schwannoma, Meningioma, spinal tumor, Intradural Extramedullary lesions.

**Corresponding Author:** Abdul Rauf Memon
Department of Neurosurgery, Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro – Pakistan
**Email:**

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## INTRODUCTION

Primarily tumors of the spinal cord are 2–4% compared to all the tumors related to the central nervous system; these lesions can be intramedullary (in the cord itself), intradural extramedullary (under dural sheath), or extradural.[1] The common tumors involving dural sheath are tumors are neurofibromas, schwannomas, and meningiomas while less observed lesions are lipomas, ependymomas, paragangliomas, hemangiomas, metastatic deposits, or nerve sheath myxomas.[2] The Neurofibroma are well-demarcated intraneural or extraneural lesions having a mix of types of cells, including perineurial-like cells, Schwann cells, and fibroblasts. They are commonly as a cutaneous nodule occasionally involving spinal roots.[3]

MRI of the spine is the state of the art to diagnose intradural spinal tumors, but the need for CSF analyses, angiography, CT scans, and neurophysiological examination can be valuable. Anatomical location and histopathological diagnosis play pivotal roles in managing this type of lesion clinical presentation.[4] Although, with recent advancements in the neurosurgical treatment of spinal tumors (STs), the surgery manipulation has the risk of per-operative damage, having morbidity ranging from 3.7% to 7.5%.[5] The neurosurgical goal is to have the best possible resection of the tumor, without compromising the neurological function. Microscope is commonly carried out in cranial surgery; however, in recent times, this technique has not been implemented for spinal surgery.[6] Common names can be found between brain and spinal tumors but evidence suggests that there may be differences in the histopathological and genetic features of intradural spinal tumors compared to their cranial counterparts. While both tumor types may arise from similar cell lines or exhibit overlapping morphological characteristics, their distinct anatomical environments and molecular signatures suggest differing pathophysiology and potentially unique therapeutic approaches. For example, the microenvironment of the spinal cord, including cerebrospinal fluid dynamics and blood supply, can influence tumor behavior, progression, and response to treatment in ways that differ significantly from brain tumors.[7] The thoracic area has neurofibroma as a common tumor, while in the cervical and lumbar area schwannomas are common.[8]

Cerebrospinal fluid (CSF) leaks are a common complication following spinal surgery for tumors, and implementing an effective protocol for managing postoperative CSF leakage is crucial in preventing a cascade of related adverse outcomes. These potential complications include wound infection, intracranial hemorrhage, arachnoiditis, nerve root entrapment, and meningitis. Studies have reported that unintended durotomies, a key cause of CSF leaks, many larger frame studies have up to 16% leak. Proper identification and management of these leaks are essential to reducing the risk of further complications and ensuring optimal recovery for patients.[9]

This study was conducted to evaluate the functional outcomes of spinal tumor surgeries performed at our center, with a focus on prognosis, clinical presentation, and surgical results. This study is its kind conducted at our institution related to the outcome of spinal tumor experience.

## MATERIALS & METHODS

### Study Design, Duration, and Place

This cross-sectional descriptive study was conducted at the Department of Neurosurgery, Liaquat University of Medical and Health Sciences, Jamshoro from 12 March 2021 to 11 July 2024. The study was approved by the Research Review Committee of The Liaqat University of Medical & Health Sciences (Ref: LUMHS/REC/503).

### Sample Size

The sample size was calculated by the WHO sample size calculator by taking the prevalence of favorable outcome=59.8% (21), margin of error=8%, the calculated sample size was 145 at a 95% confidence interval.

## Inclusion Criteria

Patients of any age whose diagnosis was primary spinal cord lesions with symptomatic were included and diagnosed via MRI spine contrast.

## Exclusion Criteria

Patients who were operated on at some other centers or operated on due to any reason, patients who did not have follow-up, and patients who had spinal, vascular lesions, abscesses, or metastasis cases were excluded.

## Pre-surgery and Post-surgery Evaluation

All clinical history, demographic details, radiological findings, examination, and observations during the operation were evaluated. The site of the tumor is either the cervical spine, thoracic spine, and lumbar spine. We had 145 patients with spinal cord tumors admitted and operative procedures were performed. Written informed consent was taken from patients included in the study. The Demographic location, details, clinical presentation, imaging, and clinical outcome were analyzed in medical data. Frankel's scale was used for pre-surgical and post-surgical to observe the neurological status and for pain, vas was used as a scale.[10,11] A preoperative and postoperative MRI was done in all operative cases. Surgical removal was performed with an assistance microscope. Tumors were generally resected including the capsule wall. Removing the tumor tissue, 95% of tumor mass removal was considered almost complete removal only leaving the peripheral tumor attached to normal neural tissue. If the resection was <95% of the tumor and > 75% of the tumor, then it was considered subtotal resection. Favorable outcome at discharge was defined as an improvement in the mMcC score and non-favorable outcome as a postoperative deterioration. In the case of a stable mMcC score, only values <3 was regarded as a favorable outcome, whereas an mMcC >2 was assigned an unfavorable outcome.

## Statistical Analysis

Data analysis was done by IBM SPSS Statistics v27. Mean and standard deviation were computed for quantitative variables whereas frequency and percentages were reported for qualitative variables. The Chi-square/fisher exact test was applied to check the association between qualitative variables. Odds were calculated by binary logistic regression. Adjusted odds were calculated for variables significant on univariate analysis. P-values ≤0.05 were considered as significant.

Tests were applied by stating that binary logistic regression offers a more thorough, adjusted analysis that accounts for confounding variables and quantifies the relationship in terms of odds ratios, whereas the chi-square test is helpful for an initial evaluation of association. The validity and robustness of our findings are strengthened by this dual approach and output based on logistic evaluation the value of e beta is the odds ratio.

# RESULTS

## Demographic Profile

The current study included 145 patients in total, with 65.5% of them being male. The majority (75.2%) were older than 60, whereas the mean age was 65.65±6.43 years (Table 1).

## Clinical Profile

Every patient had paresis, with a mean duration of 14.44±8.46 days. 29% of patients experienced paresis within 7 days, 25.5% between 8 and 15 days, and 45.5% beyond 15 days. The average length of hospital stay was 8.64±3.53 days, and the average length of surgery was 169.99±52.01 minutes. In contrast to the 15.9% of tumors in the cervical spine, 73.8% in the thoracic spine, and 10.3% in the lumbar spine, there were 13.8% intramedullary and 86.2% extramedullary tumors. Of the 145 patients, 13.8% had ASA-I, 15.2% had ASA-II, and 71% had ASA-III; in contrast, 31.7% had Level 1 laminectomy, 43.4% had Level 2, 22.8% had Level 3, and 2.1% had Level 4. Eight percent of patients required dorsal stabilization, 9.7% had surgical issues, 11.7% had medical difficulties, 66.2% required perioperative corticosteroid administration, and 11% required neuromonitoring (Table 1). Among 145 patients, 11.7% had radiating pain, 34.5% had back discomfort, 82.1% had sensory deficiency, and 71% had bowel/bladder dysfunction upon admission (Figure 1).

## Functional Outcome

The mean McCormick score was 3.17±0.67 and 2.56±0.92 on admission and discharge, respectively, and the mean KPS was 49.42±11.78 and 49.42±11.78 receptively.

**Table 1:** Descriptive statistics of the study population.

| | Frequency (%) |
|---|---|
| **Gender** | |
| Male | 95(65.5) |
| Female | 50(34.5) |
| **Age(years); mean ± std. dev** | 65.65±6.43 |
| Groups | |
| ≤60 years | 36(24.8) |
| >60 years | 109(75.2) |
| **Paresis duration (days); mean ± std. dev** | 14.44±8.46 |
| Groups | |
| ≤7 days | 42(29) |
| 8-15 days | 37(25.5) |
| >15 days | 66(45.5) |
| **Surgery duration (min); mean ± std. dev** | 169.99±52.01 |
| Groups | |
| ≤180 min | 94(64.8) |
| >180 min | 51(35.2) |
| **Length of stay (days); mean ± std. dev** | 8.64±3.53 |
| Groups | |
| ≤7 days | 59(40.7) |
| >7 days | 86(59.3) |
| **Tumor Type** | |
| Intramedullary | 20(13.8) |
| Extramedullary | 125(86.2) |
| **Tumor location** | |
| Cervical spine | 23(15.9) |
| Thoracic spine | 107(73.8) |
| Lumbar spine | 15(10.3) |
| **ASA Status** | |
| ASA-I | 20(13.8) |
| ASA-II | 22(15.2) |
| ASA-III | 103(71) |
| **Levels of laminectomy** | |
| Level 1 | 46(31.7) |
| Level 2 | 63(43.4) |
| Level 3 | 33(22.8) |
| Level 4 | 3(2.1) |
| **Tumor resection** | |
| GTR | 42(29) |
| STR | 101(69.7) |
| Biopsy | 2(1.4) |
| **Perioperative use of corticosteroids** | 96(66.2) |
| **Use of Neuromonitoring** | 16(11) |
| **Dorsal stabilisation** | 12(8.3) |
| **Surgical complications** | 14(9.7) |
| **Surgical complications Type (n=14)** | |
| Post Op spinal hematoma | 6(42.9) |
| Wound healing disorders | 4(28.6) |
| CSF fistula | 3(21.4) |
| Other | 1(7.1) |
| **Medical Complication** | 17(11.7) |
| **Functional Outcome** | |
| Un-favorable | 58(40) |
| Favorable | 87(60) |

There 9% of patients had Frankel grade A at admission, 18.6% had grade B, and 72.4% had grade C. However, upon discharge, 1.4% of patients had grade A, 4.1% had grade B, 39.3% had grade C, 51% had grade D, and 4.1% had grade E. (Table 2). There were 40% of patients in our study found unfavorable and 60% with favorable outcomes (Table 1).

## Associations of Functional Outcome with demographic and clinical profile

Age group (p<0.001), duration of paresis (p<0.001), bowel/bladder dysfunction (p=0.011), tumor type (p=0.049), tumor resection (p=0.005), perioperative usage of corticosteroids (p=0.045), and medical complications (p=0.006) were found to be significantly associated with functional outcomes (Table 3).

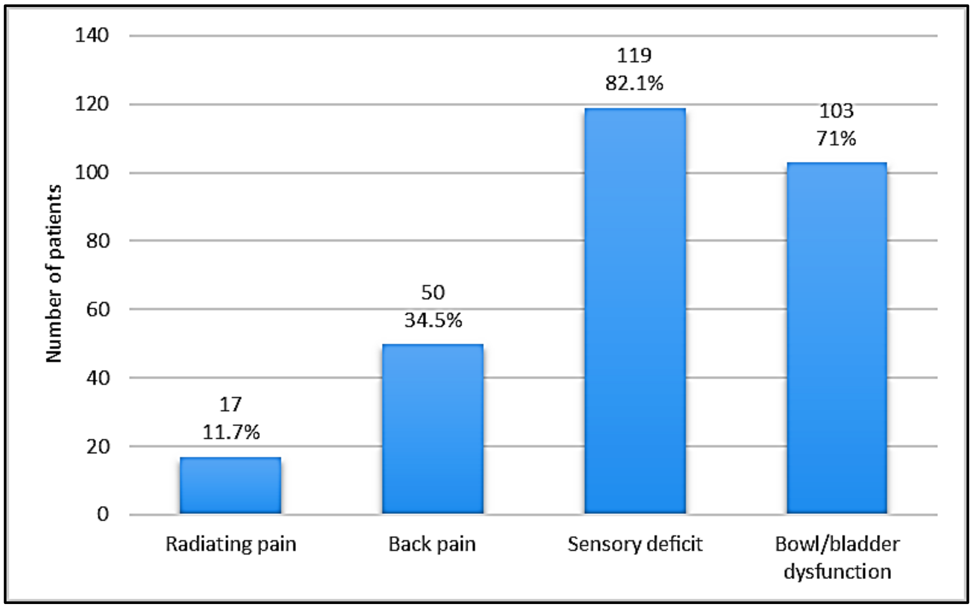


**Figure 1:** Presenting complaints at admission.

**Table 2:** KPS, McCormick Score, and Frankel Grade on admission and discharge.

| | Frequency (%) On Admission | On Discharge |
|---|---|---|
| KPS; mean ± std. dev | 49.42±11.78 | 49.42±11.78 |
| McCormick Score; mean ± std. dev | 3.17±0.67 | 2.56±0.92 |
| **Frankel Grade** | | |
| Grade A | 13(9) | 2(1.4) |
| Grade B | 27(18.6) | 6(4.1) |
| Grade C | 105(72.4) | 57(39.3) |
| Grade D | 0(0) | 74(51) |
| Grade E | 0(0) | 6(4.1) |

KPS: Karnofsky Performance Scale

## Odds of Un-favorable Functional Outcome with demographic and clinical profile

Compared to female patients, male patients had a lower chance of experiencing an unfavorable outcome (OR=0.685, p=0.286). Compared to patients who stay in the hospital for more than seven days, those who stay for less than seven days are less likely to experience an unfavorable outcome (OR=0.505, p=0.055). Compared to patients with extramedullary tumors, those with intramedullary tumors are more likely to experience an unfavorable outcome (p=0.055, OR=2.576). Compared to patients with lumbar spine tumors, patients with tumors in the cervical spine (OR=1.538, p=0.533) and the thoracic spine are more likely to experience an unfavorable outcome. Patients who experience surgical complications are more likely to have an unfavorable outcome than those who do not. (p=0.425, OR=1.569). Compared to those without medical complications, those who do have a higher chance of experiencing unfavorable outcomes. (p=0.010, OR=4.278) (Table 4). The odd ratio is used for in-depth analysis of poor outcomes and reasons, which can also be seen with chi-square, but to assess the judge, a better analysis of poor outcome reasons. The variable's last response was taken as a reference group and according to the odds ratio.

**Table 3:** Association of functional outcomes.

| | Functional Outcome | | p-value |
|---|---|---|---|
| | Favorable | Un-favorable | |
| **Gender** | | | |
| Male | 60(69) | 35(60.3) | 0.285 |
| Female | 27(31) | 23(39.7) | |
| **Age Group** | | | |
| ≤60 years | 13(14.9) | 23(39.7) | <0.001* |
| >60 years | 74(85.1) | 35(60.3) | |
| **Duration of paresis** | | | |
| ≤7 days | 18(20.7) | 24(41.4) | <0.001* |
| 8-15 days | 16(18.4) | 21(36.2) | |
| >15 days | 53(60.9) | 13(22.4) | |
| **Duration of surgery** | | | |
| ≤180 min | 58(66.7) | 36(62.1) | 0.570 |
| >180 min | 29(33.3) | 22(37.9) | |
| **Length of stay** | | | |
| ≤7 days | 41(47.1) | 18(31) | 0.053 |
| >7 days | 46(52.9) | 40(69) | |
| **Presenting complaint on admission** | | | |
| Radiating Pain | 11(12.6) | 6(10.3) | 0.673 |
| Back Pain | 31(35.6) | 19(32.8) | 0.721 |
| Sensory deficit | 73(83.9) | 46(79.3) | 0.480 |
| Bowel/bladder dysfunction | 55(63.2) | 48(82.8) | 0.011* |
| **Tumor Type** | | | |
| Intramedullary | 8(9.2) | 12(20.7) | 0.049* |
| Extramedullary | 79(90.8) | 46(79.3) | |
| **Tumor location** | | | |
| Cervical spine | 13(14.9) | 10(17.2) | 0.821 |
| Thoracic spine | 64(73.6) | 43(74.1) | |
| Lumbar spine | 10(11.5) | 5(8.6) | |
| **ASA Status** | | | |
| ASA-I | 15(17.2) | 5(8.6) | 0.333 |
| ASA-II | 13(14.9) | 9(15.5) | |
| ASA-III | 59(67.8) | 44(75.9) | |
| **Levels of laminectomy** | | | |
| Level 1 | 26(29.9) | 20(34.5) | 0.842 |
| Level 2 | 37(42.5) | 26(44.8) | |
| Level 3 | 22(25.3) | 11(19) | |
| Level 4 | 2(2.3) | 1(1.7) | |
| **Tumor resection** | | | |
| GTR | 33(37.9) | 9(15.5) | 0.005* |
| STR | 53(60.9) | 48(82.8) | |
| Biopsy | 1(1.1) | 1(1.7) | |
| **Perioperative use of corticosteroids** | | | |
| Yes | 52(59.8) | 44(75.9) | 0.045* |
| No | 35(40.2) | 14(24.1) | |
| **Use of Neuromonitoring** | | | |
| Yes | 11(12.6) | 5(8.6) | 0.449 |
| No | 76(87.4) | 53(91.4) | |
| **Dorsal stabilization** | | | |
| Yes | 5(5.7) | 7(12.1) | 0.223 |
| No | 82(94.3) | 51(87.9) | |

| | | | |
|---|---|---|---|
| **Surgical complications** | | | |
| Yes | 7(8) | 7(12.1) | 0.422 |
| No | 80(92) | 51(87.9) | |
| **Medical Complication** | | | |
| Yes | 5(5.7) | 12(20.7) | 0.006* |
| No | 82(94.3) | 46(79.3) | |

The Chi-square/fisher exact test was applied.
P-values <0.05 were considered as significant.
*Significant at 0.05 levels.

**Table 4:** Odds for non-favorable outcome.

| | Un-adjusted | | Adjusted | |
|---|---|---|---|---|
| | **p-value** | **Odds ratio (95% CI)** | **p-value** | **Odds ratio (95% CI)** |
| **Gender** | | | | |
| Male | 0.286 | 0.685(0.342-1.372) | | |
| Female | | *Reference value | | |
| **Age Group** | | | | |
| ≤60 years | <0.001* | 3.741(1.698-8.243) | 0.006* | 3.695(1.446-9.442) |
| >60 years | | *Reference value | | *Reference value |
| **Duration of paresis** | | | | |
| ≤7 days | <0.001* | 5.436(2.298-12.860) | <0.001* | 6.143(2.280-16.551) |
| 8-15 days | <0.001* | 5.351(2.199-13.022) | <0.001* | 7.483(2.620-21.374) |
| >15 days | | *Reference value | | *Reference value |
| **Duration of surgery** | | | | |
| ≤180 min | 0.570 | 0.818(0.409-1.636) | | |
| >180 min | | Reference value | | |
| **Length of stay** | | | | |
| ≤7 days | 0.055 | 0.505(0.251-1.014) | | |
| >7 days | | Reference value | | |
| **Presenting complaint on admission** | | | | |
| **Radiating Pain** | | | | |
| Yes | 0.674 | 0.797(0.277-2.290) | | |
| No | | *Reference value | | |
| **Back Pain** | | | | |
| Yes | 0.721 | 0.880(0.436-1.776) | | |
| No | | *Reference value | | |
| **Sensory deficit** | | | | |
| Yes | 0.481 | 0.735(0.313-1.728) | | |
| No | | *Reference value | | |
| **Bowel/bladder dysfunction** | | | | |
| Yes | 0.013* | 2.793(1.244-6.270) | 0.002* | 4.995(1.778-14.033) |
| No | | *Reference value | | *Reference value |
| **Tumor Type** | | | | |
| Intramedullary | 0.055 | 2.576(0.981-6.766) | | |
| Extramedullary | | *Reference value | | |
| **Tumor location** | | | | |
| Cervical spine | 0.533 | 1.538(0.397-5.956) | | |
| Thoracic spine | 0.612 | 1.344(0.429-4.206) | | |
| Lumbar spine | | *Reference value | | |
| **ASA Status** | | | | |
| ASA-I | 0.146 | 0.447(0.151-1.323) | | |

| | | | | |
|---|---|---|---|---|
| ASA-II | 0.876 | 0.928(0.364-2.365) | | |
| ASA-III | | *Reference value | | |
| **Levels of laminectomy** | | | | |
| Level 1 | 0.733 | 1.538(0.130-18.192) | | |
| Level 2 | 0.786 | 1.405(0.121-16.324) | | |
| Level 3 | 1.000 | 1.000(0.081-12.270) | | |
| Level 4 | | *Reference value | | |
| **Tumor resection** | | | | |
| GTR | 0.375 | 0.273(0.015-4.801) | | |
| STR | 0.945 | 0.906(0.055-14.881) | | |
| Biopsy | | *Reference value | | |
| **Perioperative use of corticosteroids** | | | | |
| Yes | 0.047* | 2.115(1.011-4.427) | 0.008* | 3.626(1.396-9.419) |
| No | | *Reference value | | *Reference value |
| **Use of Neuromonitoring** | | | | |
| Yes | 0.451 | 0.652(0.214-1.985) | | |
| No | | *Reference value | | |
| **Dorsal stabilization** | | | | |
| Yes | 0.185 | 2.251(0.678-7.471) | | |
| No | | *Reference value | | |
| **Surgical complications** | | | | |
| Yes | 0.425 | 1.569(0.520-4.736) | | |
| No | | *Reference value | | |
| **Medical Complication** | | | | |
| Yes | 0.010* | 4.278(1.418-12.904) | 0.020* | 5.123(1.295-20.277) |
| No | | *Reference value | | *Reference value |

Binary logistic regression was applied.
Reference value: the variable's last response was taken as a **reference value**
p-value<0.05 was considered significant.
*Significant at 0.05 levels.

*Output based on logistic evaluation, the value of beta is evaluated by odds ratio; the variable's last response was taken as a *reference value* and according to odds ratio was calculated based on calculation. The odd ratio is used for in-depth analysis of poor outcomes and reasons, which can also be seen with chi-square, but to assess the judge, a better analysis of poor outcome reasons. While the variable's last response was taken as a reference group.

## DISCUSSION

In our study, the current study included 145 patients in total, with 65.5% of them being male. The majority (75.2%) were older than 60, whereas the mean age was 65.65±6.43 years. Every patient had paresis, with a mean duration of 14.44±8.46 days. 29% of patients experienced paresis within 7 days, 25.5% between 8 and 15 days, and 45.5% beyond 15 days. The average length of hospital stay was 8.64±3.53 days, and the average length of surgery was 169.99±52.01 minutes. In contrast to the 15.9% of tumors in the cervical spine, 73.8% in the thoracic spine, and 10.3% in the lumbar spine, there were 13.8% intramedullary and 86.2% extramedullary tumors. Of the 145 patients, 13.8% had ASA-I, 15.2% had ASA-II, and 71% had ASA-III; in contrast, 31.7% had Level 1 laminectomy, 43.4% had Level 2, 22.8% had Level 3, and 2.1% had Level 4. Eight percent of patients required dorsal stabilization, 9.7% had surgical issues, 11.7% had medical difficulties, 66.2% required peri-operative corticosteroid administration, and 11% required neuromonitoring. The mean McCormick score was 3.17±0.67 and 2.56±0.92 on admission and discharge, respectively, and the mean KPS was 49.42±11.78 and 49.42±11.78 receptively. There 9% of patients had Frankel grade A at admission, 18.6% had grade B, and 72.4% had grade C. However, upon discharge, 1.4% of patients had grade A, 4.1% had grade B, 39.3% had grade C, 51% had grade D, and 4.1% had grade E. There 40% of patients in our study found unfavorable and 60% with favorable outcomes

MRI of the spinal canal is an invaluable imaging tool for detecting spinal lesions. However, while imaging characteristics can provide critical clues, a definitive histopathological diagnosis is essential. Early diagnosis, even in cases of minimally symptomatic spinal tumors, can lead to timely surgical intervention, helping to reduce the risk of morbidity or mortality. It was observed in our study that the clinical presentation with pain, numbness, and lately weakness may prevail but to diagnose the MRI spine with contrast is the gold standard.[11] MRI of the spinal canal is a vital tool for detecting spinal lesions, offering crucial imaging insights. However, a definitive diagnosis requires histopathological confirmation. Early detection, even for minimally symptomatic spinal tumors, enables timely surgical intervention, reducing the risk of morbidity and mortality. Our study found that while pain, numbness, and later weakness were common presentations, contrast-enhanced MRI remains the diagnostic gold standard.

In our study the schwannoma was the most common tumor presented, if done under a microscope with minimal compression in the cord and more spacious on the lateral side, complete removal can give a good outcome at our center. Intradural extramedullary tumors generally have a favorable prognosis, which depends on the initial neurological deficit and the overall duration of the condition. Prompt treatment can significantly improve outcomes, especially when compared to intramedullary tumors.[12,13]

The most frequently occurring spinal space-occupying lesion was spinal neurofibroma. The initial presentation of the patient and symptoms severity correlated with the degree of tumor presence in the intradural space. After surgery, there was a notable improvement in neurological deficits, independent of other contributing factors.[14] Spinal neurofibroma was the most common lesion, with symptom severity corresponding to tumor extent. Surgery consistently improved neurological deficits, independent of other factors.

In one study, Traditionally, spinal tumors have been accessed from a posterior approach, irrespective of their position concerning the spinal cord. Studies show that approximately 31% of these tumors are situated on the ventral side of the spinal cord. For tumors positioned in far lateral locations, spinal fixation or an anterior approach might be required to ensure full removal.[15,16]

Research suggests that neurological symptoms may either fully or partially improve following surgery, though in some cases, symptoms may worsen. This variability in outcomes is often influenced by factors such as the length of time the symptoms were present before surgery and the initial severity of the neurological deficit.[17] As in our study Neurological symptom outcomes after surgery vary from full recovery to partial relief or worsening, influenced by symptom duration and initial severity. Early intervention often yields better results, aiding treatment planning and managing expectations.

Gliomas, including ependymomas and astrocytoma, are the most frequent intramedullary spinal cord tumors, comprising around 80% of primary spinal cord tumors.[18] Similarly the most common histopathological tumor is found intramedullary, but the outcome depends on the size of the lesion as larger size lesions may result in neurological deficit as observed in our study while motor evoked potential and somatosensory evoked potential monitoring may give better results as per seen in our study, that evoke potential are time-consuming but patient with good motor response can benefit from this.

The success of spine tumor resection is significantly affected by the tumor's position relative to the spinal cord and dura. In this regard, somatosensory evoked potentials (SSEPs) were found to be the most accurate in forecasting postoperative deficits, especially for intramedullary tumors. Conversely, in this study, motor evoked potentials (MEPs) and multi-modal monitoring did not show any considerable benefit in anticipating permanent neurological deficits.[19]

The extradural lesions were almost completely excised but intradural intramedullary were difficult to excise and can lead to some neurological deficits. The gold standard treatment for intraspinal tumors, regardless of their size, is gross total resection of the tumor, as this approach yields better outcomes for both benign and malignant tumors. In contrast, subtotal resection is associated with poorer results. Consequently, patients with upper cervical spinal tumors who present with a high risk of poor prognosis should be prioritized for aggressive surgical intervention.[20]

## CONCLUSION

Based on the data, patients with spinal oncologic paraparesis underscores a compelling risk-benefit narrative favoring surgical intervention across various etiologies. While the findings highlight the general advantages of surgical treatment in improving outcomes, they also draw attention to specific clinical factors associated with less favorable prognoses. These include intramedullary tumor localization, elevated McCormick scores, and the presence of bladder or bowel dysfunction at the time of admission. Recognizing these factors enables clinicians to tailor their approach, balancing the potential benefits of surgery against the challenges posed by these high-risk characteristics.

## LIMITATION AND RECOMMENDATIONS

Given the uncommon nature of spinal tumors, this study involves a small sample size and a follow-up period of just a year. To improve the robustness of the findings and increase their applicability, it is advisable to collaborate with more institutions, which would help achieve a larger and more representative sample. Furthermore, extending the follow-up to at least five years is recommended to better evaluate long-term outcomes and potential risks.

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## Additional Information

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## AUTHORS CONTRIBUTIONS

| Sr. No. | Full name | Contribution to article |
|---|---|---|
| 1. | Abdul Rauf Memon | Study design and methodology, quality insurer. |
| 2. | Aurangzeb Kalhoro | Paper writing and data calculations |