

*Original Article*

# Role of MRI in Characterizing Spine and Spinal Cord Tumors Based on Anatomical Level, Tumor Position, Lesion Length, Cord Expansion, and Morphological MRI Features

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## ABSTRACT

**Background:** Spine and spinal cord tumors are clinically important lesions because delayed recognition may lead to pain, sensory disturbance, myelopathy, neurological disability, and functional decline. Magnetic resonance imaging is the principal modality for evaluating these tumors because it provides detailed visualization of tumor compartment, cord morphology, margins, and adjacent structural involvement. **Objective:** To describe the role of conventional MRI in characterizing spine and spinal cord tumors according to anatomical and morphological imaging features in adult patients. **Methods:** This prospective descriptive cross-sectional observational study was conducted at Lahore General Hospital over 90 days after synopsis approval. Sixty adult patients aged 18 years and above with spine or spinal cord tumors and complete preoperative MRI studies were included. MRI was performed using conventional T1-weighted, T2-weighted, STIR, and post-contrast T1-weighted sequences. Clinical symptoms and MRI features, including cord expansion, lesion morphology, margin definition, tumor compartment, bone involvement, and disc involvement, were analyzed descriptively using SPSS version 27.0. **Results:** The mean age was  $47.68 \pm 15.81$  years, and females comprised 53.3% of participants. Numbness was reported in 51.7%, loss of sensation in 50.0%, and lower back pain and radiating pain each in 48.3%. Extradural location was recorded in 53.3%, bone and disc involvement each in 51.7%, well-defined margins in 50.0%, and cord expansion and intramedullary location each in 48.3%. **Conclusion:** Conventional MRI provided useful anatomical and morphological characterization of spine and spinal cord tumors, particularly for identifying tumor compartment, cord expansion, lesion margins, and adjacent bone or disc involvement. Further studies with histopathological correlation and standardized reporting are needed. **Keywords:** Spinal Cord Tumors, Spine Tumors, Magnetic Resonance Imaging, Cord Expansion, Extradural Tumors, Intramedullary Tumors, Morphological Features, Tumor Characterization.

## INTRODUCTION

Spine and spinal cord tumors constitute an uncommon but clinically important group of lesions because they may cause progressive pain, sensory disturbance, motor impairment, myelopathy, sphincter dysfunction, and permanent neurological disability when diagnosis or treatment is delayed. These tumors may arise from the vertebral column, epidural space, intradural extramedullary compartment,

or spinal cord parenchyma, and their clinical manifestations are often determined by tumor compartment, anatomical level, degree of neural compression, lesion extent, and involvement of adjacent osseous or discal structures. Although several inflammatory, infectious, vascular, congenital, and degenerative conditions may mimic spinal neoplasms clinically and radiologically, accurate localization and morphological characterization remain essential for narrowing the differential diagnosis, planning surgical or non-surgical management, and estimating neurological risk (1).

Magnetic resonance imaging has become the principal imaging modality for evaluating suspected spinal and spinal cord tumors because it provides multiplanar visualization of the spinal cord, nerve roots, meninges, vertebral bodies, intervertebral discs, epidural space, and paraspinal soft tissues without ionizing radiation. Conventional MRI sequences, including T1-weighted, T2-weighted, STIR, and contrast-enhanced T1-weighted imaging, allow assessment of tumor compartment, lesion signal characteristics, cord expansion, edema, enhancement pattern, margin definition, vertebral marrow involvement, and extension into adjacent structures. Compared with radiography and computed tomography, MRI offers superior soft-tissue contrast and is particularly useful when symptoms suggest spinal cord or nerve root involvement (2,3).

The anatomical compartment of a spinal tumor is one of the most important determinants of diagnostic interpretation and management. Extradural tumors commonly involve the vertebrae and epidural space and may represent metastatic disease or primary osseous pathology, whereas intradural extramedullary tumors usually arise from meninges or nerve sheath structures and may produce cord or nerve-root compression. Intramedullary tumors arise within the spinal cord parenchyma and are less common but clinically significant because they may produce cord expansion, long-segment signal abnormality, and progressive neurological compromise. Differentiating these compartments on MRI is therefore central to preoperative planning, risk stratification, and multidisciplinary decision-making (4,5).

Despite the established role of MRI in spinal tumor evaluation, conventional MRI interpretation may remain challenging in routine clinical practice. Tumor-like inflammatory, infectious, vascular, demyelinating, and degenerative lesions may overlap with neoplastic lesions in clinical presentation and signal characteristics. In addition, spinal tumors are relatively rare, and local descriptive data on their MRI morphology, compartmental distribution, cord expansion, vertebral involvement, disc involvement, and clinical symptom profile remain limited. Standardized reporting of these features is important because radiological characterization can support diagnostic confidence and guide timely referral, although definitive diagnosis may still require histopathological confirmation in selected cases (6,7).

Previous literature has emphasized that MRI improves localization and characterization of spinal tumors and contributes substantially to surgical planning, particularly when conventional imaging is interpreted in relation to clinical symptoms and anatomical compartment. However, many published discussions focus on advanced imaging, histological subtypes, or management outcomes, while fewer single-center studies describe the practical distribution of conventional MRI findings among adult patients presenting with spine and spinal cord tumors. A focused descriptive evaluation of MRI features in such patients may therefore help clarify the frequency of clinically relevant morphological findings and support more consistent radiological assessment in routine settings (8–10).

The present study was conducted to evaluate the role of conventional MRI in characterizing spine and spinal cord tumors among adult patients by describing key anatomical and morphological imaging features, including tumor compartment, cord expansion, lesion characteristics, margin definition, bone involvement, disc involvement, and associated clinical symptoms. The study specifically aimed to determine the distribution of these MRI findings in patients with spine and spinal cord tumors and to examine how conventional MRI contributes to structured radiological characterization for clinical evaluation and preoperative assessment.

## MATERIALS AND METHODS

This prospective descriptive cross-sectional observational study was conducted at Lahore General Hospital, Lahore, Pakistan, over a period of 90 days following approval of the study synopsis. The study was designed to evaluate conventional MRI-based anatomical and morphological characteristics of spine and spinal cord tumors in adult patients. Because the objective was to describe MRI features rather than to validate MRI against a reference standard, the study was framed as a descriptive radiological characterization study and not as a diagnostic accuracy study.

A total of 60 adult patients aged 18 years and above were included. Eligible participants were patients diagnosed with a spine or spinal cord tumor who required preoperative MRI evaluation and had complete conventional MRI studies available for review. Patients were included when standard MRI sequences were available, including T1-weighted, T2-weighted, and post-contrast T1-weighted images. Patients were excluded if they had previously undergone surgery or radiation therapy for the same spinal tumor, had incomplete or poor-quality MRI scans, were ultimately found to have a non-tumorous condition such as infection or inflammation, or had contraindications to MRI, including pacemaker placement, cochlear implant, metallic foreign body, or severe claustrophobia. Written informed consent was obtained from all participants before inclusion.

Participants were selected using the sampling procedure defined for the study from eligible patients presenting during the study period. Clinical information was recorded for each participant, including age, gender, lower back pain, numbness, radiating pain to the legs, and loss of sensation. These symptoms were documented as binary clinical variables according to their presence or absence at the time of assessment. MRI evaluation was performed using a 1.5 Tesla scanner with conventional spinal imaging sequences, including T1-weighted, T2-weighted, STIR, and post-contrast T1-weighted sequences. The MRI assessment focused on anatomical and morphological tumor characteristics relevant to clinical interpretation and preoperative planning.

The principal radiological variables included cord expansion, lesion presence and morphology, margin definition, intramedullary location, extradural location, bone involvement, and disc involvement. Cord expansion was defined as visible enlargement of the spinal cord segment associated with the lesion on MRI. Well-defined margins were recorded when the lesion border was clearly distinguishable from adjacent neural or osseous structures. Intramedullary location indicated involvement within the spinal cord parenchyma, while extradural location indicated tumor localization outside the dural sac with involvement of the vertebral or epidural compartment. Bone involvement was recorded when MRI demonstrated vertebral body, posterior element, or marrow involvement associated with the lesion. Disc involvement was recorded when abnormal signal or extension involved the adjacent intervertebral disc space. All variables were entered using predefined categorical coding to maintain consistency during data handling.

To reduce information bias, only complete and interpretable MRI examinations were included. Patients with blurred or incomplete imaging were excluded to avoid misclassification of MRI features. Data were reviewed using a standardized extraction structure that captured demographic, clinical, and MRI variables consistently across all participants. Potential selection bias was recognized because the study included patients with tumors requiring surgical evaluation, which may have enriched the sample for clinically significant lesions. However, this approach was consistent with the study objective of describing preoperative MRI characteristics in patients with spine and spinal cord tumors.

The sample size was determined using the single population proportion formula, using a 95% confidence level, an estimated prevalence proportion of 0.15, and a 10% margin of error, with the final sample size set at 60 patients for the study population. Data were analyzed using IBM SPSS Statistics version 27.0. Continuous variables were summarized using mean, standard deviation, minimum, and maximum values. Categorical variables were summarized using frequencies and percentages. The

analysis was descriptive because the study objective was to characterize the distribution of MRI and clinical features rather than to test diagnostic accuracy, treatment effect, or causal associations. Percentages were calculated using the total sample denominator of 60 unless otherwise specified.

Data quality was maintained through complete case inclusion, predefined variable coding, and cross-checking of entered values against clinical and MRI records before analysis. Missing or incomplete MRI data were not included in the final analysis because interpretability of imaging variables was essential to the study objective. Participant confidentiality was maintained throughout data collection, data entry, and analysis, and all study information was used only for research purposes.

## RESULTS

A total of 60 adult patients with spine or spinal cord tumors were included in the analysis. The age of participants ranged from 18 to 75 years, with a mean age of  $47.68 \pm 15.81$  years. The 95% confidence interval for mean age was 43.60 to 51.76 years, indicating that the study population largely represented middle-aged and older adults.

*Table 1. Age Profile of Study Participants*

Variable	N	Minimum	Maximum	Mean ± SD	95% CI
Age, years	60	18	75	47.68 ± 15.81	43.60–51.76

Abbreviations: CI, confidence interval; SD, standard deviation.

The age distribution showed a broad adult range, with participants extending from early adulthood to older age. The mean age of 47.68 years suggests that spine and spinal cord tumors in this sample were most commonly evaluated in middle adulthood, although the wide standard deviation indicates substantial age variability across the included patients.

*Table 2. Gender Distribution of Study Participants*

Gender	n (%)	95% CI
Male	28 (46.7)	34.6–59.1
Female	32 (53.3)	40.9–65.4
Total	60 (100.0)	—

Abbreviation: CI, confidence interval. The 95% CI was calculated for single proportions.

Females constituted 32 of 60 participants, representing 53.3% of the study sample, while males accounted for 28 participants, representing 46.7%. The gender distribution was therefore relatively balanced, with only a slight female predominance.

*Table 3. Clinical Symptoms Among Study Participants*

Clinical Symptom	Yes, n (%)	95% CI	No, n (%)
Lower back pain	29 (48.3)	36.2–60.7	31 (51.7)
Numbness	31 (51.7)	39.3–63.8	29 (48.3)
Radiating pain to legs	29 (48.3)	36.2–60.7	31 (51.7)
Loss of sensation	30 (50.0)	37.7–62.3	30 (50.0)

Abbreviation: CI, confidence interval. The 95% CI was calculated for the proportion of participants with each symptom.

Clinical symptoms were distributed almost evenly across the study population. Numbness was the most frequently reported symptom, occurring in 31 patients (51.7%), followed by loss of sensation in 30 patients (50.0%). Lower back pain and radiating pain to the legs were each reported by 29 patients (48.3%). This pattern indicates that sensory symptoms were at least as frequent as pain-related symptoms among patients evaluated for spine and spinal cord tumors in this cohort.

*Table 4. Morphological MRI Findings Among Study Participants*

MRI Finding	Yes, n (%)	95% CI	No, n (%)
Cord expansion	29 (48.3)	36.2–60.7	31 (51.7)
MRI-visible lesion characteristic recorded	29 (48.3)	36.2–60.7	31 (51.7)
Well-defined margins	30 (50.0)	37.7–62.3	30 (50.0)

MRI Finding	Yes, n (%)	95% CI	No, n (%)
Intramedullary location	29 (48.3)	36.2–60.7	31 (51.7)
Extradural location	32 (53.3)	40.9–65.4	28 (46.7)
Bone involvement	31 (51.7)	39.3–63.8	29 (48.3)
Disc involvement	31 (51.7)	39.3–63.8	29 (48.3)

Abbreviations: CI, confidence interval; MRI, magnetic resonance imaging. The 95% CI was calculated for the proportion of participants with each MRI finding.

MRI findings showed a relatively balanced distribution of morphological features. Extradural location was the most frequently recorded compartmental feature, identified in 32 patients (53.3%), while intramedullary location was recorded in 29 patients (48.3%). Bone involvement and disc involvement were each present in 31 patients (51.7%), indicating that structural involvement of adjacent spinal components was common in this cohort. Cord expansion was observed in 29 patients (48.3%), and well-defined lesion margins were present in 30 patients (50.0%), suggesting that MRI provided clinically relevant information on both tumor compartment and lesion morphology.

Table 5. Summary of Predominant Clinical and MRI Features

Domain	Most Frequent Feature	n (%)	95% CI
Clinical symptom	Numbness	31 (51.7)	39.3–63.8
Pain-related symptom	Lower back pain	29 (48.3)	36.2–60.7
Pain-related symptom	Radiating pain to legs	29 (48.3)	36.2–60.7
Sensory symptom	Loss of sensation	30 (50.0)	37.7–62.3
Tumor compartment feature	Extradural location	32 (53.3)	40.9–65.4
Structural MRI feature	Bone involvement	31 (51.7)	39.3–63.8
Structural MRI feature	Disc involvement	31 (51.7)	39.3–63.8
Cord-related MRI feature	Cord expansion	29 (48.3)	36.2–60.7

Abbreviations: CI, confidence interval; MRI, magnetic resonance imaging. The 95% CI was calculated for single proportions.

The combined clinical and MRI profile showed that numbness was the most frequent clinical symptom, while extradural location was the most frequent MRI compartmental feature. Bone and disc involvement were each present in slightly more than half of the cohort, supporting the relevance of MRI for identifying associated structural involvement in patients with spine and spinal cord tumors. Cord expansion was present in nearly half of the sample, indicating that cord-related morphological assessment remains an important component of MRI evaluation.

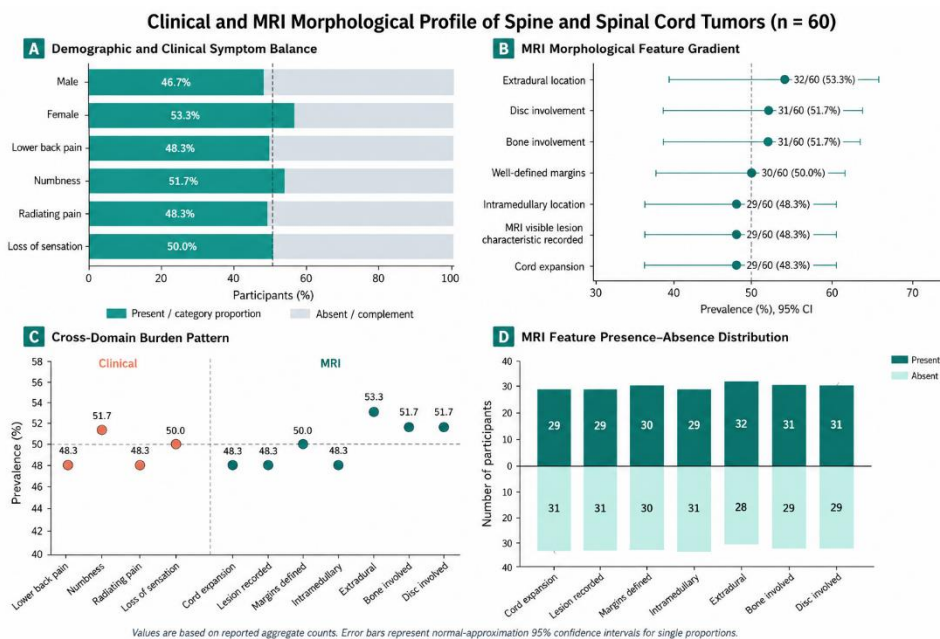


Figure 1 Clinical and MRI Morphological Profile of Spine and Spinal Cord Tumors

The panelled figure summarizes the clinical and MRI morphology profile of 60 patients with spine and spinal cord tumors. Clinical symptoms were distributed almost evenly, with numbness reported in 31 patients (51.7%), loss of sensation in 30 patients (50.0%), and lower back pain and radiating pain each

reported in 29 patients (48.3%). MRI morphology showed a similarly balanced pattern, with extradural location recorded in 32 patients (53.3%), bone involvement and disc involvement each recorded in 31 patients (51.7%), well-defined margins in 30 patients (50.0%), and cord expansion, intramedullary location, and MRI-visible lesion characteristics each recorded in 29 patients (48.3%). The confidence intervals around these proportions overlap substantially, indicating that no single clinical or radiological feature dominated the cohort. Overall, the figure supports the interpretation that conventional MRI contributed mainly by providing a structured morphological profile across tumor compartment, cord-related change, and adjacent structural involvement rather than by identifying one overwhelmingly prevalent imaging pattern.

Reviewer-style note: The current dataset supports descriptive reporting only. Anatomical spinal level and lesion length were stated in the study title/objective but were not available in the supplied Results data; therefore, these variables should either be added to the Results using the original dataset or removed from the title, objective, and Methods. No p-values, odds ratios, regression estimates, diagnostic accuracy measures, or effect sizes were reported because the manuscript does not provide group comparisons, raw patient-level data, histopathological reference-standard results, or sufficient inputs for those analyses.

## DISCUSSION

This prospective descriptive cross-sectional study evaluated the clinical profile and conventional MRI-based morphological characteristics of 60 adult patients with spine and spinal cord tumors. The principal finding was that conventional MRI enabled structured characterization of tumor-related features across clinically relevant domains, including tumor compartment, cord expansion, margin definition, bone involvement, disc involvement, and associated neurological symptoms. Extradural location was the most frequently recorded compartmental feature, observed in 32 patients (53.3%), while bone involvement and disc involvement were each present in 31 patients (51.7%). Cord expansion and intramedullary location were each recorded in 29 patients (48.3%), and well-defined margins were present in 30 patients (50.0%). These findings support the practical role of MRI as a morphological assessment tool in patients with spine and spinal cord tumors, while the descriptive design of the present study does not allow direct estimation of diagnostic accuracy, sensitivity, specificity, or interobserver reliability.

The age profile of the cohort, with a mean age of  $47.68 \pm 15.81$  years and an age range of 18 to 75 years, indicates that spinal tumor evaluation in this setting involved a broad adult population. Females accounted for 53.3% of the sample and males for 46.7%, reflecting a relatively balanced gender distribution. Although the study was not designed to determine sex-specific tumor risk, this distribution is compatible with the recognized heterogeneity of spinal tumor epidemiology, where frequency varies according to tumor compartment, histological subtype, metastatic status, and anatomical origin. Previous literature has emphasized that spinal tumors represent a diverse group of extradural, intradural extramedullary, and intramedullary lesions, each with different clinical and radiological implications, which reinforces the need to interpret demographic findings in relation to compartmental and morphological characteristics rather than sex alone (4,5).

The clinical symptoms observed in the present study were also evenly distributed, with numbness reported in 31 patients (51.7%), loss of sensation in 30 patients (50.0%), and lower back pain and radiating pain to the legs each reported in 29 patients (48.3%). This symptom pattern suggests that sensory complaints were at least as common as pain-related symptoms in this cohort. Such findings are clinically plausible because spinal and spinal cord tumors may produce symptoms through vertebral involvement, epidural compression, nerve-root irritation, intradural compression, or direct cord involvement. Prior studies have described pain, numbness, weakness, sensory disturbance, and progressive myelopathy as common presentations in spinal tumor patients, particularly when lesions affect neural structures or produce cord compression (1,8). However, symptoms alone are often insufficient to distinguish neoplastic lesions from inflammatory, vascular, infectious, or demyelinating spinal cord conditions,

making imaging-based localization and morphological assessment essential in clinical decision-making (6,7).

The predominance of extradural involvement in 53.3% of patients is an important radiological finding because extradural tumors often involve the vertebral column, epidural space, or adjacent osseous structures. This pattern is consistent with established descriptions of spinal tumor distribution, in which extradural lesions are frequently encountered in clinical practice and may be associated with vertebral or metastatic disease (4,5). The concurrent presence of bone involvement in 51.7% of patients further supports the relevance of MRI in identifying vertebral marrow or structural involvement. MRI is particularly valuable in this context because it can demonstrate soft-tissue extension, marrow signal abnormality, epidural disease, discal involvement, and neural compression more effectively than radiography, while computed tomography remains useful for detailed osseous assessment in selected cases (2,3).

Disc involvement was also present in 51.7% of patients. Although discal abnormality may occur in various spinal pathologies, including degenerative, infectious, inflammatory, and neoplastic processes, its documentation in tumor evaluation is clinically important because disc-space involvement or adjacent structural change may influence differential diagnosis, surgical planning, and assessment of local disease extent. In the present study, disc involvement was reported descriptively and was not correlated with tumor histology, anatomical level, or clinical outcomes; therefore, the finding should be interpreted as a morphological observation rather than evidence of a specific tumor type. Future studies incorporating histopathological confirmation, anatomical-level mapping, and compartment-wise analysis could clarify whether disc involvement differs meaningfully between extradural, intradural extramedullary, and intramedullary tumor groups.

Cord expansion was identified in 48.3% of patients and represents one of the most clinically relevant MRI features in spinal tumor assessment. Cord expansion may suggest intramedullary involvement, edema, tumor infiltration, or mass effect depending on the imaging context and associated signal characteristics. In intramedullary tumors, MRI is central to evaluating cord enlargement, lesion extent, signal heterogeneity, enhancement, cystic change, syrinx formation, and relationship to adjacent neural tissue. The present findings support the value of documenting cord expansion routinely, but the study does not provide lesion length, enhancement pattern, edema pattern, or histological subtype; therefore, the interpretation of cord expansion remains limited to descriptive morphology. Prior work has emphasized that intramedullary spinal cord tumors require careful MRI-based evaluation because preoperative neurological status, tumor location, and degree of cord involvement may affect management decisions and outcomes (8,9).

Well-defined margins were observed in 50.0% of patients. Margin definition is important because it may influence radiological confidence, surgical planning, and differentiation between circumscribed and infiltrative lesions. Some spinal tumors demonstrate relatively clear planes from surrounding tissue, whereas others may be infiltrative and difficult to distinguish from adjacent neural parenchyma. The presence of well-defined margins in half of the cohort suggests variability in lesion morphology, but the study did not classify tumors by histology or compare margin definition with operative findings. Consequently, this finding should be interpreted cautiously as an imaging descriptor rather than a predictor of resectability or tumor biology. Prior literature has shown that MRI provides useful preoperative information in spinal cord tumors, but definitive interpretation often requires correlation with clinical presentation, operative findings, and histopathology (9,10).

The findings also demonstrate that conventional MRI remains clinically useful even when advanced imaging is not routinely available. Advanced techniques such as diffusion tensor imaging have been explored for differentiating infiltrating and non-infiltrating spinal cord tumors and for evaluating spinal cord tract involvement, but technical challenges, limited availability, and the rarity of primary spinal cord tumors restrict their routine use in many clinical settings (11). In such settings, careful

interpretation of conventional sequences remains essential. The present study used standard MRI sequences and focused on routinely reportable features, which may increase practical applicability in resource-constrained or routine hospital environments. However, future research incorporating advanced imaging, standardized reporting templates, and histopathological correlation could improve diagnostic confidence and reproducibility.

The clinical importance of accurate spinal tumor characterization extends beyond imaging description because spinal tumors may cause neurological compromise, disability, prolonged hospitalization, and reduced quality of life, particularly when associated with cord injury or progressive compression (12). Metastatic spinal disease and cervical spine involvement require especially careful localization and multidisciplinary decision-making because management may depend on stability, neural compression, systemic disease status, and expected prognosis (13). In the present study, surgical outcome, tumor histology, metastatic status, and neurological follow-up were not assessed, which limits the ability to link MRI features with treatment decisions or prognosis. Nevertheless, the descriptive findings support the role of MRI as a first-line modality for mapping tumor morphology and associated structural involvement before definitive management.

An important strength of the present study is its focused evaluation of clinically relevant MRI features in a defined adult cohort. The study provides a structured summary of symptoms and imaging morphology using a single-sample descriptive design. However, several limitations must be considered. First, the sample size was limited to 60 patients from a single center, which restricts generalizability. Second, inclusion of patients requiring surgical evaluation may have introduced selection bias by overrepresenting clinically significant or more advanced lesions. Third, the study did not include histopathological correlation, diagnostic accuracy analysis, interobserver agreement, or follow-up outcomes; therefore, claims regarding MRI sensitivity, specificity, reliability, or prognostic value cannot be made from these data. Fourth, anatomical spinal level, lesion length, enhancement pattern, tumor histology, and intradural extramedullary classification were not reported in the available results, despite their importance for comprehensive tumor characterization. Finally, because spinal tumor mimics may include inflammatory, infectious, vascular, and granulomatous lesions, future studies should incorporate standardized diagnostic algorithms and clear exclusion confirmation methods (14–16).

Overall, the present study indicates that conventional MRI provides clinically meaningful descriptive information in adult patients with spine and spinal cord tumors, particularly for identifying tumor compartment, cord expansion, lesion margins, bone involvement, and disc involvement. The findings should be interpreted as a morphological profile rather than a validation of MRI diagnostic accuracy. Larger multicenter studies with histopathological confirmation, standardized MRI reporting, anatomical-level mapping, lesion-length measurement, interobserver reliability assessment, and clinical outcome follow-up are needed to establish the diagnostic and prognostic utility of specific MRI features in spinal tumor evaluation.

## CONCLUSION

Conventional MRI provided a structured morphological profile of spine and spinal cord tumors in this single-center cohort of 60 adult patients, with extradural location recorded in 53.3%, bone and disc involvement each recorded in 51.7%, well-defined margins in 50.0%, and cord expansion and intramedullary location each recorded in 48.3%. Numbness was the most frequent clinical symptom, followed by loss of sensation, lower back pain, and radiating pain to the legs. These findings support the clinical value of MRI for anatomical localization and morphological characterization of spinal tumors, particularly in assessing compartmental distribution, cord-related changes, and adjacent structural involvement. However, because the study was descriptive and did not include histopathological correlation, diagnostic accuracy testing, interobserver reliability assessment, or clinical outcome follow-up, the findings should not be interpreted as evidence of MRI sensitivity or specificity. Larger

multicenter studies with standardized MRI reporting and reference-standard confirmation are recommended to strengthen the diagnostic and prognostic interpretation of MRI features in spine and spinal cord tumors.

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