Thesis

Epidemiology and Demographics of Spinal Tumors: Insights from a Tertiary Spine Care Center in India

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Abstract

Background: Spinal tumours — primary and metastatic — present with a range of symptoms and require tailored diagnostic and therapeutic strategies. This retrospective study describes the demographic profile, presenting features, anatomical level distribution and histological diagnoses of consecutive patients with spinal and vertebral tumours treated at a tertiary spine centre.

Methods: Hospital records of consecutive patients seen between January 2011 and December 2015 were reviewed for age, sex, presenting complaints, neurologic status, tumour level and compartment, imaging findings and histology where obtained. Contrast-enhanced MRI was the principal imaging modality used to define tumour extent.

Results: One hundred and one patients met inclusion criteria; primary tumours comprised the majority while metastatic disease formed a substantial subgroup. Extradural lesions were the most common compartment and the lumbar spine was the most frequently involved level. Pain was the near-universal presenting symptom and neurological deficit was seen in a substantial number. Multiple myeloma and nerve-sheath tumours were prominent among primaries, while lung and breast were common primaries for metastases.

Conclusion: Metastatic disease constitutes a large component of spinal tumours in tertiary referral practice. Early MRI-based assessment and histological confirmation where indicated support timely, pathology-directed management and multidisciplinary care.

Keywords: Spinal tumour, Metastasis, Myeloma, Schwannoma, MRI

Introduction

Spinal neoplasms may arise within the vertebrae, the epidural space, the intradural compartment or the spinal cord itself. They are broadly classified as primary or metastatic and by dural relation as extradural, intradural-extra medullary or intramedullary; these distinctions carry practical implications for presentation and management. Pain is the most common initial complaint, with radicular pain and axial mechanical pain frequently prompting imaging and clinic review. Progressive motor weakness, sensory disturbance and sphincter dysfunction occur when neural elements become compromised. Contrast-enhanced magnetic resonance imaging is the cornerstone of diagnostic work-up, supplemented selectively by CT or bone scintigraphy to characterise bony involvement and to stage systemic disease when needed. Histological diagnosis, obtained by biopsy or


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resection, remains essential to distinguish haematological malignancies, primary bone tumours and metastatic deposits and to guide oncological therapy. Institutional series from tertiary centres show that extradural lesions, most often metastatic, make up a major part of clinical caseloads and that benign intradural-extramedullary tumours such as schwannomas and meningiomas continue to be frequent surgical diagnoses. Understanding the local case mix — the relative proportions of primary versus metastatic disease, the common histologies encountered and the typical presenting features — helps tailor diagnostic pathways, plan operative services and coordinate multidisciplinary care. This study presents a consecutive series managed at our centre between January 2011 and December 2015, summarising demographic features, level distribution, presenting complaints and histological patterns to inform local clinical practice and resource allocation. [1–3]

Aims & Objectives

Aim: To describe demographic features, presenting symptoms, anatomical level and dural compartment distribution, and histological diagnoses of patients with spinal and vertebral tumours presenting to a tertiary spine centre between January 2011 and December 2015. Objectives: To inform diagnostic pathways and local service planning.

Review of Literature

Large institutional series and registry analyses provide complementary perspectives on spinal tumours. Institutional reports commonly show that extradural lesions — largely metastatic — are the single largest category encountered in clinical practice, while intradural-extramedullary tumours such as schwannomas and meningiomas account for many benign presentations. Intramedullary tumours are less common but pose significant management challenges because of their location within the cord substance. Haematological malignancies such as multiple myeloma and primary bony tumours are repeatedly reported among extradural primaries and are notable for causing vertebral collapse and pathological fracture. Several series document diagnostic delays, particularly for benign extramedullary lesions that may present with slowly progressive radicular symptoms, whereas more aggressive intramedullary lesions often prompt earlier investigation. Magnetic resonance imaging with contrast is universally recommended for lesion characterisation and to plan the surgical approach, while CT and bone scan are useful adjuncts for assessing cortical destruction and disease burden when necessary. Histological diagnosis by percutaneous biopsy or open sampling is the definitive method for differentiating among myeloma, primary bony tumours and metastatic disease and for guiding definitive oncological therapy. Management strategies range from observation for asymptomatic benign lesions to microsurgical resection for symptomatic or progressive lesions, radiotherapy for radiosensitive tumours, and systemic therapy for disseminated malignancy. Stabilisation with instrumentation is frequently required when vertebral body collapse threatens alignment or neural elements, and combined approaches may be necessary for tumours that extend through neural foramina. Outcomes depend on tumour pathology, preoperative neurological status and extent of resection or decompression; benign extramedullary tumours generally show better functional recovery than malignant or intramedullary processes. Multidisciplinary pathways that include spine surgeons, medical and radiation oncologists and rehabilitation teams are emphasised repeatedly in the literature to optimise functional outcomes and resource use. Institutional series enrich registry data by providing granular clinical detail such as symptom duration, neurological grade and decision-making rationale, which are crucial for tailoring local care pathways. [4–11]

Materials and Methods

This retrospective observational study included consecutive patients with spinal and vertebral tumours treated at the Department of Spine, Sancheti Institute for Orthopaedics and Rehabilitation, Pune, from January 2011 to December 2015. Inclusion criteria captured primary and metastatic tumours involving vertebral bodies, epidural, intradural and intramedullary compartments. Data were abstracted from outpatient records, inpatient charts, radiology reports, operative notes and pathology reports. Extracted variables included age, sex, presenting complaint, duration of symptoms, neurological examination findings, tumour level and compartment, imaging characteristics and histologic diagnosis when available. Contrast-enhanced MRI was the primary imaging modality for delineating lesion extent and relation to neural structures; CT and bone scan were employed selectively to assess bony destruction or to stage systemic disease. Indications for biopsy included radiological uncertainty, suspected haematological malignancy or need to plan adjuvant oncological therapy. Treatment decisions — observation, biopsy, and decompression with or without instrumentation, radiotherapy, or systemic therapy — were made by the treating team based on pathology, imaging and patient factors. Data were summarised descriptively with counts and proportions to characterise case mix, level distribution and histological patterns. Institutional retrospective audit approval and local ethical procedures were followed and patient confidentiality preserved during data handling. [12–14]

Results

Over the five-year period, 101 consecutive patients met inclusion criteria. Of these, 68 patients (67%) had primary spinal tumours and 33 patients (33%) presented with metastatic disease. Extradural lesions made up approximately 70 cases (≈69% of the cohort), while intradural-extramedullary

tumours accounted for about 31 cases (≈31%). The lumbar spine was the most commonly involved region, with 40 of 101 patients (39.6%) affected; thoracic and thoracolumbar levels together represented roughly 35 patients (≈35%), and the remaining cervical and sacral cases numbered about 26 (≈25.4%). The series included 66 males and 35 females (male:female ≈1.89:1). Among primary histologies, multiple myeloma was frequent (26 cases) and schwannoma was the leading benign nerve-sheath tumour (17 cases). In metastatic presentations the lung was the most frequent primary site, followed by breast. Pain was the presenting complaint in 98 of 101 patients (≈97%), and 48 patients (≈47.5%) exhibited neurological deficit at presentation. Vertebral compression fractures or pathological collapse occurred in 38 patients (≈37.6%), most often associated with myeloma or metastatic deposits. Recorded management included biopsy, decompression with or without instrumentation, radiotherapy and systemic therapy, with specific choices driven by pathology and clinical status; follow-up documentation was variable across the cohort.

Discussion

The numeric profile of this series mirrors common patterns seen in tertiary referral practices: extradural lesions form the larger proportion of cases and metastatic deposits make up a substantial component of the workload. The preponderance of lumbar involvement likely reflects the combination of regional pain symptomatology prompting investigation and the anatomical load-bearing vulnerability of the lumbar vertebrae to destructive processes. Male predominance in this cohort may reflect local referral patterns and the demographic distribution of underlying primaries in the population served. The notable representation of multiple myeloma among primary diagnoses emphasises the need to include haematological malignancy in the differential of vertebral destructive lesions and to obtain timely serum and imaging-based evaluations. The high rate of vertebral compression fractures and structural compromise underlines the biomechanical consequences of neoplastic disease; these cases often necessitate surgical stabilisation to relieve pain and protect neurological function. Pain as the dominant presenting complaint highlights the need for clinicians to maintain a low threshold for advanced imaging when red flags or progressive deficits are present. Outcomes in spinal neoplasia hinge on pathology, preoperative neurological status and the extent of decompression or resection achieved; benign extramedullary tumours generally have more favourable functional recoveries than high-grade or intramedullary lesions. Limitations of this work include its retrospective design, possible referral bias inherent to a tertiary centre and variable follow-up documentation. Nevertheless, detailed institutional data contribute clinical nuance to registry-based incidence reports and inform local service planning. Future prospective collection of functional and quality-of-life outcomes will better delineate the impact of different interventions and guide resource allocation. [15–19]

Conclusion

Over the five-year period reviewed, metastatic tumours formed a substantial portion of spinal neoplasms managed at this tertiary centre; primary tumours including multiple myeloma and schwannoma were also frequently encountered. Extradural disease predominated and the lumbar spine was the most common anatomical level affected. Pain was the predominant presenting complaint and nearly half the patients had neurological deficits at the time of presentation, underlining the clinical burden of spinal tumours. Early MRI assessment and histological diagnosis where indicated are central to planning definitive therapy. A multidisciplinary approach spanning surgical, oncological and rehabilitation services is essential to address pain, protect or restore neurological function and manage spinal stability. Institutional series such as this help prioritise diagnostic pathways and resource allocation for improved patient care.

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