Original Article
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Survivorship and Functional Outcomes after Surgery for Metastatic Spinal Disease Including Cord Compression: Single-Surgeon Cohort Series from UK Tertiary Center

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Learning Point of the Article:

While survival in metastatic spinal disease, including cord compression, is largely dictated by tumor biology, surgical intervention remains integral to multidisciplinary care, providing meaningful improvements in pain and health-related quality of life.

Abstract

Introduction: Metastatic spinal disease, including cord compression, represents a significant complication of advanced malignancy and is associated with pain, neurological deficit, and reduced quality of life. Surgical intervention continues to play a vital role in management for selected patients. Survivorship following surgery varies widely and is influenced by tumor biology and systemic disease burden.

Aims: The aim of the study is to evaluate survival and functional outcomes in patients surgically treated for metastatic spinal disease including cord compression, by a single surgeon at a UK tertiary spinal center.

Materials and Methods: Retrospective case series of prospectively collected data from 45 patients undergoing surgery for metastatic spinal disease, including cord compression. Data included demographics, tumor histology, Bilsky grade, spinal instability neoplastic score (SINS), neurological status, surgical procedure, complications, survival, and functional outcomes (Visual Analog Scale [VAS], EuroQol-5 dimension (EQ-5D), and Oswestry disability index [ODI]). Paired pre- and post-operative comparisons were performed using appropriate statistical tests (paired t-test or Wilcoxon), and survival analysis was conducted using Kaplan–Meier and Cox regression.

Results: Mean patient age was 61.7 ± 12.9 years (Range 23.9–81.3 years), with 51% female predominance. The most common primary tumors were lung (20%), breast (17.8%), myeloma (15.6%), and renal cell carcinoma (13.3%). High-grade epidural spinal cord compression (Bilsky 2–3) was present in 60%. At presentation, 65% had no neurological deficit, 19% had radicular symptoms, and 14% had incomplete spinal cord injury. Most patients had intermediate SINS scores (66%), while 34% were classified as unstable. Decompression with stabilization was most frequent (67%), followed by debulking (20%) and complex/reconstructive procedures (13%). Post-operative complications occurred in 11% (5/45), with no peri-operative deaths. In the subset with complete functional data (n = 28), mean VAS improved from 47.3 to 68.9 and EQ-5D index from 0.17 to 0.56 ($P < 0.001$). Median post-operative survival was 12 months, mean survival 31.4 months, and 30-day mortality was 4.3%. Tumor histology was a significant predictor of survival (log-rank $\chi2 = 14.4$, $P = 0.006$), with myeloma and breast cancer patients showing the most favorable outcomes. Post-operative ODI category was also associated with survival (log-rank $\chi^2 = 12.2$, $P = 0.028$).

Conclusion: Surgery for metastatic spinal disease including cord compression was associated with meaningful functional improvement and survival outcomes that are consistent with historical expectations. These findings support the continued role of surgical intervention as part of a multidisciplinary approach in appropriately selected patients with symptomatic disease.

Keywords: Spine, cord compression, metastases, surgery, functional outcomes, survivorship.

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Introduction

Metastatic spinal disease is a serious complication of malignancy, affecting approximately 5–10% of cancer patients during their illness [1]. It is considered an oncological emergency because untreated compression can lead to irreversible motor deficit, sensory loss, and sphincter dysfunction [2]. Metastatic spinal cord compression (MSCC) typically results from tumor invasion into the epidural space, compressing the spinal cord or cauda equina [3]. Timely recognition and management are therefore critical to preserving neurological function and quality of life.

The epidemiological burden of metastatic spinal disease is substantial. Population-based data from South-East Norway reported an annual incidence of 26/100,000 for metastatic spinal disease requiring intervention, and 8.1/100,000 for MSCC [4]. In that cohort, 31% of patients presented with established MSCC and 11% were non-ambulatory at first assessment, highlighting the frequency of late or advanced presentation.

Decompression and stabilization, typically followed by radiotherapy, remain central to the management of selected patients with spinal metastases, particularly those with mechanical instability or progressive neurological decline [5]. Prognostic factors influencing treatment choice include tumor histology, systemic disease burden, functional status, and severity of neurological deficit [6].

Survival outcomes vary significantly depending on the biology of the primary tumor. For example, a large multicenter cohort study by Choi et al. showed that survival outcomes following surgery for metastatic spinal disease including cord compression are strongly determined by primary tumor biology and the extent of systemic disease [7]. Their prognostic model reinforces the value of individualized assessment when selecting patients for operative intervention.

Despite advances in systemic therapy and radiotherapy techniques, metastatic spinal disease continues to present urgently with pain, instability, and neurological compromise. Surgery remains a critical part of multidisciplinary care, offering mechanical stabilization and decompression in selected patients. However, contemporary UK data reporting survivorship and functional outcomes following surgery for metastatic spinal disease including cord compression remain limited.

The aim of this study was to evaluate survival and functional outcomes following surgical treatment of metastatic spinal disease including cord compression in a single-surgeon cohort at a UK tertiary center.

Aims

The aim of the study is to evaluate survivorship and functional outcomes in a cohort of patients who underwent surgical treatment for metastatic spinal disease, including cord compression, at a UK regional center between 2018 and 2024.

Materials and Methods

We analyzed a retrospective case series of prospectively collected data for patients who underwent surgical treatment for metastatic spinal disease, including cord compression, under a single surgeon at the Walton Centre, Liverpool, UK, between June 2018 and June 2024.

No formal sample size calculation was performed, as this study represents a retrospective analysis of all consecutive eligible patients treated within the study period at a single tertiary center. The cohort size was therefore determined by case availability.

The study was registered as a service evaluation with the institutional audit department. Ethical approval was not required under NHS Health Research Authority guidance, as the analysis adhered to anonymized routinely collected data.

Data were collected from the spinal oncology referral database at Clatterbridge Cancer Centre.

Demographic and clinical information included sex, age at presentation, primary tumor histology, neurological deficits, extent of spinal instability and compression, type of surgery, perioperative complications, pre- and post-operative functional outcomes, and survival.

All variables were extracted from the British Spine Registry and cross-verified with EP2 electronic health

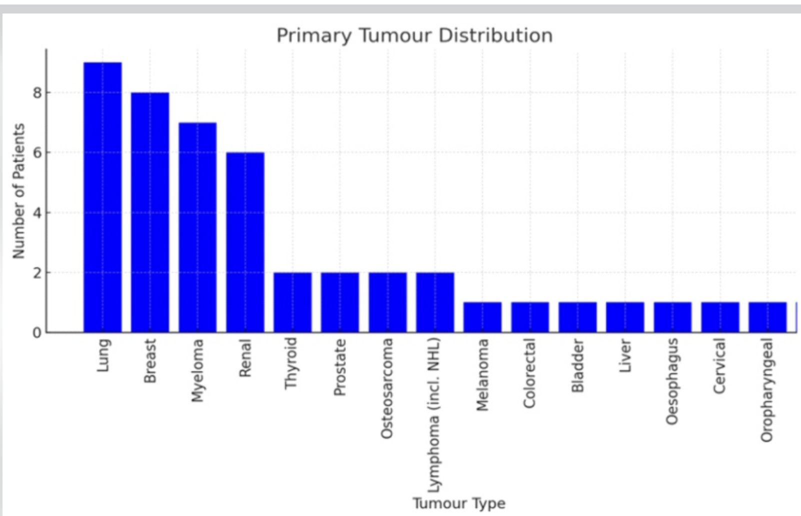


Figure 1: Malignancy frequency (n=45).

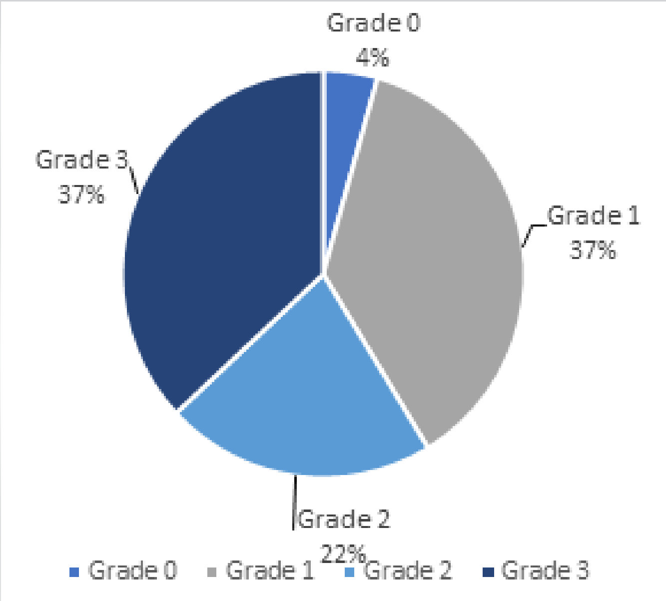


Figure 2: Bilsky grade (n=45).

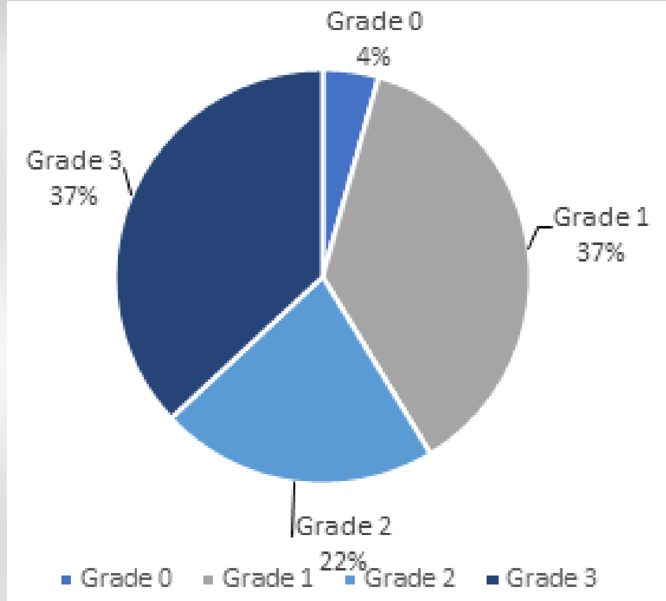


Figure 3: Neurological status at presentation (n=43).

records to ensure accuracy. Survival status was confirmed through electronic health records at the last follow-up.

Statistical data were analyzed using IBM Statistical Package for the Social Sciences Statistics, Version 31.0.

Inclusion criteria

- Age ≥18 years
- Radiological or histological confirmation of metastatic spinal disease
- Surgical intervention for metastatic spinal disease, including cases presenting with cord compression.

Exclusion criteria

- Non-surgical management
- No confirmed metastatic spinal pathology.

Outcomes

The primary outcome was overall survival following surgery, defined as the time from index surgery to death. Secondary outcomes included survival by tumor histology, survival by degree of cord compression (Bilsky grade), post-operative functional outcomes, and perioperative complications. Analyses used complete-case methods (EuroQol-5 dimension [EQ-5D]/Visual Analog Scale [VAS] n = 28; Oswestry disability index [ODI] n = 22).

For each patient, the following variables were recorded: Age, sex, primary tumor type, spinal instability neoplastic score (SINS), epidural spinal cord compression (Bilsky) grade, neurological status at presentation, operative procedure, post-operative complications, pre- and post-operative functional outcomes (VAS; EQ-5D where available), ODI where available, and survival.

Functional outcomes were evaluated using the EQ-5D questionnaire pre- and post-operatively. Health status was summarized as EQ-5D index values, where a score of 1 represented full health and 0 represented death. In addition, EQ VAS scores were collected to complement EQ-5D data, measuring patients' self-reported health on a scale of 0–100, ranging from "worst health imaginable" to "best health possible."

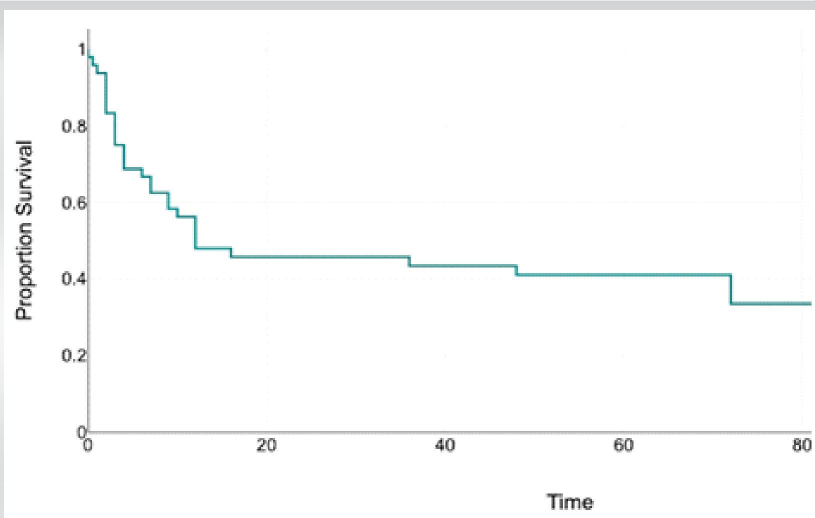


Figure 4: Overall survival curve (n=45).

Table 1: Baseline patient demographics and clinical characteristics

Characteristic	*n* (%) or Mean (SD; Range)
Total	45
Age (SD)	61.7 (12.9; 23.9–81.3 years)
Sex	
Male	22 (48.9)
Female	23 (51.1)
Histology	
Lung	9 (20.0)
Breast	8 (17.8)
Myeloma	7 (15.6)
Renal	6 (13.3)
Other pathologies[a]	15 (33.3)
Spinal instability neoplastic score (*n*=35)	11.8 (2.3; 8–17)
Indeterminate (7–12)	23 (65.7)
Unstable (13–18)	12 (34.3)
Epidural spinal cord compression (*n*=45)	
Low grade (Bilsky 0-1c)	18 (40.0)
High grade (Bilsky 2–3)	27 (60.0)
Neurological deficit (*n*=43)	
Cauda equina	1 (2.3)
Incomplete spinal cord injury	6 (14.0)
Radiculopathy	8 (18.6)
Neurologically intact (None)	28 (65.1)2

[a]The "Other Pathologies" category (*n*=15) consists of diverse malignancies with low individual frequencies, including prostate carcinoma (*n*=2), osteosarcoma (*n*=2), lymphoma (*n*=2), thyroid (*n*=2), and single cases of cervical, melanoma, liver, bladder, esophagus, colorectal, and head/neck carcinomas. SD: Standard deviation

Primary and secondary survival outcomes evaluated the event of interest, such as death of a patient. Patients who did not experience the event of interest by the end of follow-up time were censored for the purpose of Kaplan–Meier analysis.

Results

A total of 45 cases were included in the study. The distribution of primary tumor types is summarized in Table 1 and Fig. 1. The median follow-up duration for the cohort was 12.0 months. Mean follow-up was 27.6 months, reflecting a positively skewed distribution due to a small number of long-term survivors extending up to 108 months post-operatively.

Decompression with stabilization was the most frequent procedure (67%), followed by debulking/extended decompression (20%) and complex/reconstructive procedures (13%). For analysis, procedures were categorized into three cohorts based on procedural complexity. The standard decompression/stabilization group (n = 30) included patients who underwent decompression and stabilization only. The debulking/extended decompression group (n = 9) included patients who underwent debulking or debridement in addition to decompression and stabilization. The complex/reconstructive group (n = 6) included patients who underwent corpectomy, reconstruction/fusion, or vertebral body augmentation in addition to decompression and stabilization.

Pre-operative imaging using the Bilsky scale showed that 60% of patients (n = 27) had high-grade compression (Bilsky 2–3), while 40% (n = 18) had low-grade compression (Bilsky 0–1c) (Fig. 2).

Pre-operative neurological status was recorded for 43 patients (94%) (Fig. 3).

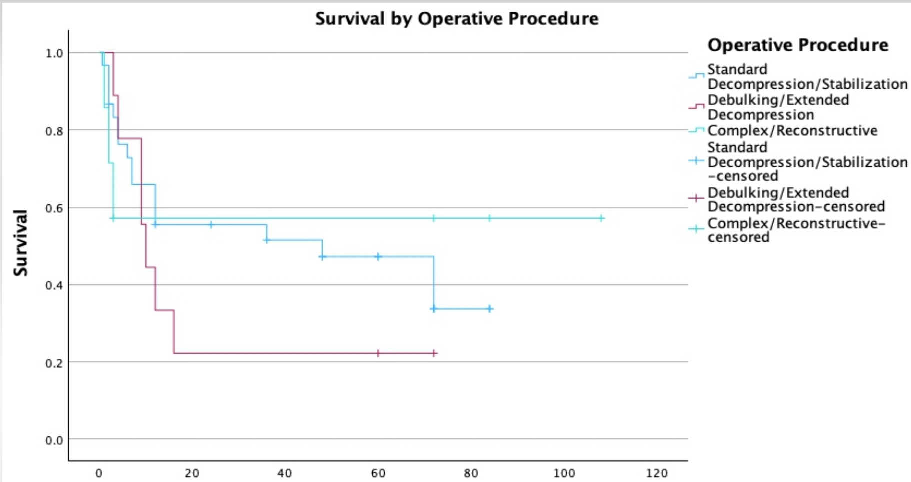
Most patients (n = 28) presented without focal (motor or sensory) neurological deficits. Among those presenting with neurological compromise (n = 15), symptoms included radiculopathy (n = 8), incomplete spinal cord injury (American Spinal Injury Association C/D; n = 6) [8], and cauda equina syndrome (n = 1) [9]. Post-operative neurological outcomes were not consistently recorded.

Spinal mechanical stability was assessed preoperatively using the SINS. All patients with available SINS data (n = 35) scored ≥7, showing that no patients had stable spines (SINS 0–6). Most patients (n = 23, 66%) had indeterminate instability (SINS 7–12), while the remaining 12 (34%) were classified as unstable (SINS 13–18).

One intraoperative complication (significant bleeding) and five post-operative complications (11%; 5/45), including wound infection, pulmonary embolism, pseudo-ileus, dural tear, and late wound breakdown, were observed [10]. No in-hospital deaths occurred. The 30-day mortality rate was 4.3% (2/45).

Overall survival analysis was evaluated as a primary baseline measure for all 45 patients. At the time of data cutoff, 27 deaths (58.7%) had occurred. Kaplan–Meier analysis revealed early post-operative mortality followed by a plateau of long-term survivors. The median overall post-operative survival was 12 months (95% confidence interval [CI]: 0.0–49.5), and the mean survival was 31.38 months. The 1-year overall survival rate was 50.5% (standard error [SE], 0.075), with estimated 2-year and 5-year survival rates of 48.1% (SE, 0.075) and 42.8% (SE, 0.076), respectively (Fig. 4).

Stratified by operative procedure, patients who underwent

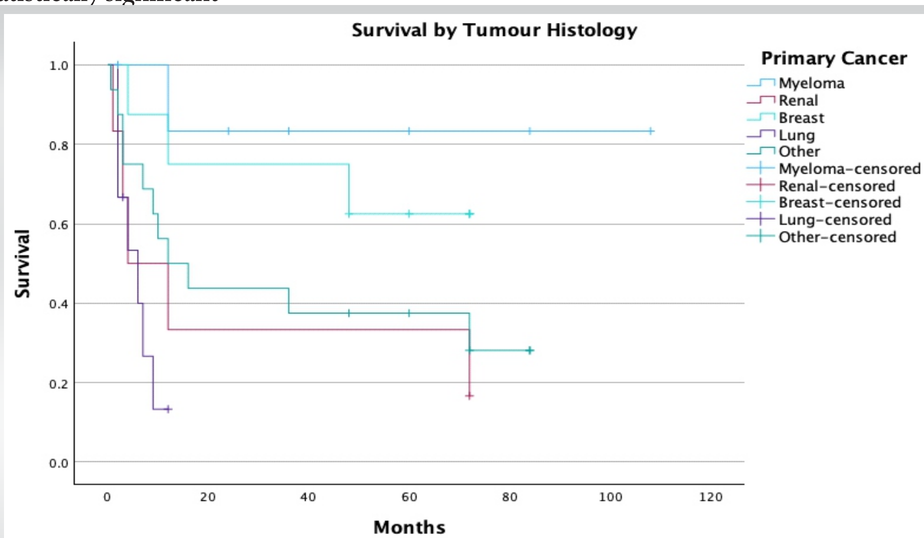


Operative procedure	N	N (censored)	Median survival time (months) (%)	6-month survival (%)	12-month survival (%)	24-month survival (%)	60-month survival (%)	Hazard ratio
Standard Decompression/Stabilization (Reference)	30	13	49.42	66	55	55	46	1
Debulking/Extended decompression	9	2	11	44	22	22	22	1.494
Complex/Reconstructive	6	3	5.5	45	45	45	45	1.242

Figure 5: Kaplan–Meier plot of overall survival time (months) for patients stratified by operative (n=45)

standard decompression and stabilization (n = 30) showed the longest median survival of 48.0 months (95% CI: 0.0–99.5). The patients who underwent debulking or extended decompression (n = 9) had a median survival of 10.0 months (95% CI: 7.1–13.0). For patients who underwent complex/reconstructive surgery (n = 6), median survival was not reached (NR) at the time of data cutoff. Survival differences among the intervention groups were not statistically significant (Log-Rank χ^2 = 0.87; P = 0.646) (Fig. 5).

Primary tumor histology was a significant predictor of survival (Log-Rank χ^2 = 14.4, P = 0.006), reflecting heterogeneity among cancer types. Patients with myeloma and breast cancer had the most favorable outcomes, with median survival NR in either group due to >50% of patients remaining alive at follow-up. Mean survival was longest for myeloma patients at 92.0 months (95% CI: 63.4–120.6) and 53.0 months (95% CI: 34.2–71.8) for breast cancer (Fig. 6). In contrast, renal cell carcinoma and lung cancer patients experienced rapid post-operative decline, with median survival of 4.0 months (95% CI: 0.0–14.8) and 6.0 months (95% CI: 0.9–11.1), respectively. The "other pathologies" group (n = 15) showed an intermediate profile, with a median survival of 12.0 months (95% CI: 3.2–20.9).

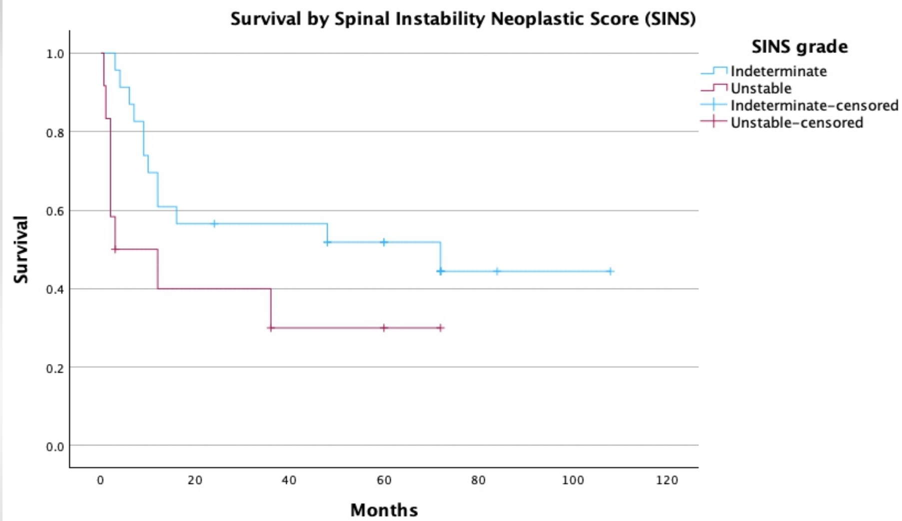


Primary tumor	N	N (censored)	Median survival time (months)	6-month survival (%)	12-month survival (%)	24-month survival (%)	60-month survival (%)	Hazard ratio
Myeloma (reference)	7	6	108	100	83	83	83	1
Breast	8	5	72	88	75	75	61	2.348
Lung	9	2	6.44	53	13	-	-	15.337
Renal	6	1	12	50	33%	33	33	8.043
Other	15	5	13.5	53	40	40	33	6.597

Figure 6: Survival by primary tumor histology (n=45).

A multivariate Cox proportional hazards model assessing age, tumor histology, and operative procedure identified tumor histology as the only statistically significant predictor of post-operative survival (P = 0.030). Using myeloma as the reference, lung cancer patients had a significantly higher mortality hazard (hazard ratio [HR]: 16.0; 95% CI: 1.9–137.8; P = 0.012). Renal (HR: 8.4; 95% CI: 0.9–74.0; P = 0.056) and "other" histologies (HR: 7.0; 95% CI: 0.9–56.8; P = 0.056) trended toward increased hazard, while breast cancer did not differ significantly from myeloma (HR: 2.4; 95% CI: 0.2–23.0; P = 0.463). Extent of surgery, either extended debulking/decompression (HR: 0.9; 95% CI: 0.3–2.3; P = 0.776) or complex/reconstructive procedures (HR: 1.0; 95% CI: 0.2–4.0; P = 0.987), did not significantly impact survival nor did patient age (HR: 1.0; 95% CI: 0.9–1.0; P = 0.844).

Kaplan–Meier analysis using the SINS assessed the impact of pre-operative mechanical instability on survival (Fig. 7). Ten patients (22.2%) were excluded due to missing baseline data, leaving 35 cases for analysis. Patients were stratified into intermediate instability (SINS 7–12, n = 23) and unstable



Spinal instability neoplastic score	N	N (censored)	Median survival time (months)	6-month survival (%)	12-month survival (%)	24-month survival (%)	60-month survival (%)	Hazard ratio
Intermediate (reference)	23	11	72.81	70	57	57	51	1
Unstable	12	4	5.75	48	38	38	27	2.194

Figure 7: Kaplan–Meier survival plot by SINS (n=35).

(SINS 13–18, n = 12). The unstable cohort showed a rapid decline in survival compared with the intermediate group, with a median survival of 3.0 months (95% CI: 0.0–18.4) versus 72.0 months (95% CI: 0.0–174.5). Despite this difference, the result did not reach statistical significance (Log-Rank χ^2 = 3.14; P = 0.076).

To evaluate the prognostic effect of spinal cord compression, patients were stratified into low-grade (Bilsky 0–1c, n = 18) and high-grade (Bilsky 2–3, n = 27) groups. Kaplan–Meier analysis showed no statistically significant difference (Log-Rank χ^2 = 1.95; P = 0.162). Median survival was 72.0 months (NR) for low-grade compression and 12.0 months (95% CI: 9.6–14.4) for high-grade compression. Mean survival was 61.1 months (95% CI: 38.6–83.6) and 29.2 months (95% CI: 16.9–41.4), respectively (Fig. 8). Median survival NR to >50% of patients remaining alive at follow-up.

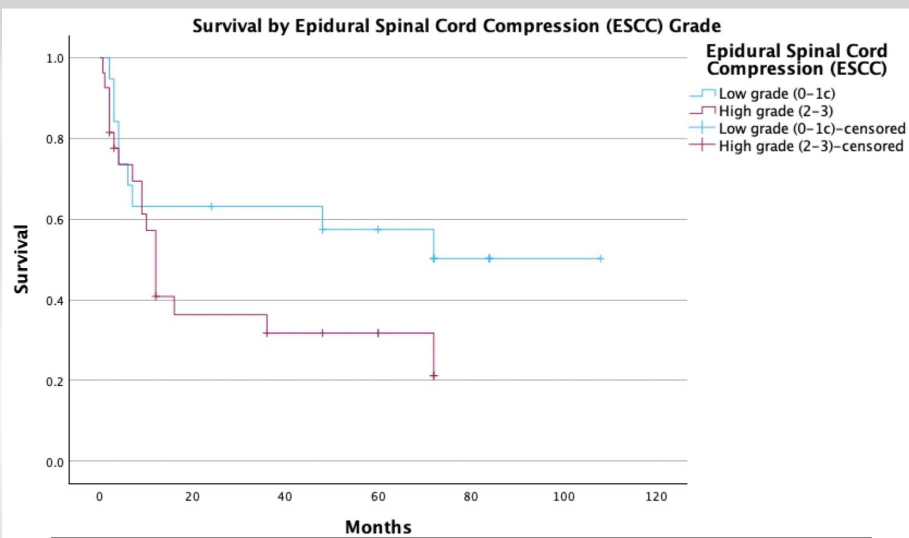
A secondary bivariate Cox proportional hazards model assessed the combined impact of SINS and Bilsky grade on post-operative survival, with 35 patients included after listwise deletion of missing data. The model was not statistically significant (P = 0.064). Adjusted for SINS, high-grade compression showed a trend toward increased mortality (HR: 2.3; 95% CI: 0.8–6.3; P = 0.122). Adjusted for compression, unstable SINS was associated with a higher hazard (HR: 2.2; 95% CI: 0.9–5.5; P = 0.095). Wide CIs reflect reduced statistical power due to small sample size.

Kaplan–Meier survival analyses are summarized in Table 2, with multivariate Cox proportional hazards results presented in Table 3.

Functional outcomes were assessed using paired pre- and post-operative measures. EQ-5D data were available for 28 patients (61%). Surgical intervention led to significant improvements in both the EQ-5D index and VAS scores.

The EQ-5D index increased from 0.17 (standard deviation [SD]: 0.32) pre-operatively to 0.56 (SD: 0.31) post-operatively, a mean improvement of 0.38 (95% CI: 0.24–0.53; P < 0.001), exceeding the minimal clinically important difference (Δ ≥0.10) (Table 3) [11]. Effect size analysis indicated a large treatment effect (Cohen's d = 1.04).

EuroQol-VAS scores rose from 47.32 (SD: 23.51) to 68.86 (SD: 22.06), a mean improvement of 21.53 points (95% CI: 10.85–32.21; P < 0.001), representing a medium-to-large clinical benefit (Cohen's d = 0.78).



Epidural spinal cord compression grade	N	N (censored)	Median survival time (months)	6-month survival (%)	12-month survival (%)	24-month survival (%)	60-month survival (%)	Hazard ratio
Low-grade (reference)	18	10	74.82	61	61	61	55	1
High-grade	27	9	13.95	57	36	36	31	1.745

Figure 8: Survival by epidural spinal cord compression Grade (n=45).

ODI scores were available for 22 patients (48.9%) and were stratified into five categories of disability: Minimal (0–20%, n = 3, 13.6%), moderate (21–40%, n = 6, 27.3%), severe (41–60%, n = 3, 13.6%), crippled (61–80%, n = 8, 36.4%), and bed-bound (81–100%, n = 2, 9.1%). Within this subgroup, 12 deaths occurred (54.5%), with 45.5% of patients censored at last follow-up.

Kaplan-Meier analysis revealed a statistically significant difference in survival across ODI categories (Log-Rank χ^2 = 12.2; P = 0.028) (Fig. 9). Patients with minimal disability had no recorded deaths. The moderate disability group experienced 2 deaths (33% mortality) with a median survival of 72.0 months (SE: 41.5). The crippled group accounted for 5 deaths with a median survival of 9.0 months (SE: 5.7). Patients with severe disability (n = 3) had 100% mortality, with a median survival of 12.0 months (SE: 9.3). Bed-bound patients had a median survival of 9.0 months.

Post-operative ODI category was significantly associated with survival, though causality cannot be inferred.

Discussion

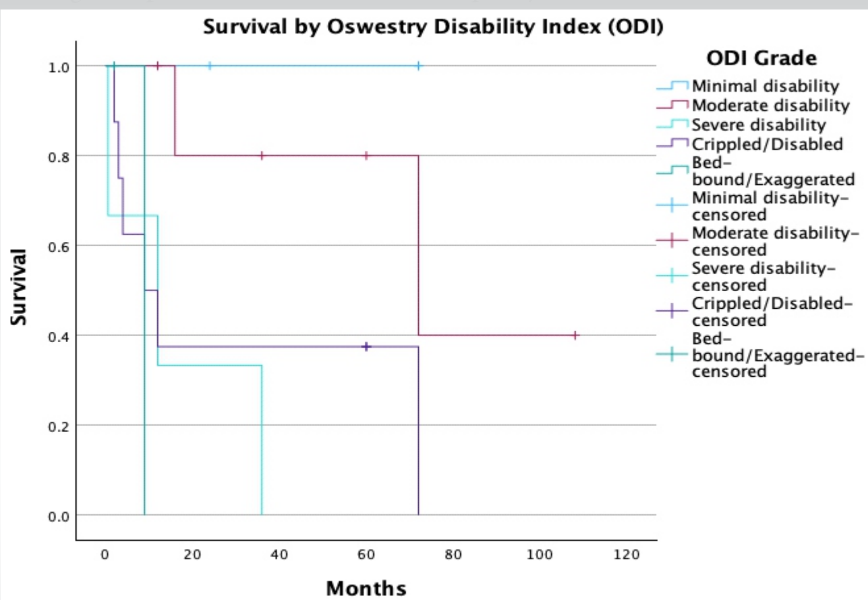
This contemporary UK single-surgeon series cohort demonstrates that surgical intervention for metastatic spinal disease including cord compression results in clinically meaningful improvements in health-related quality of life, with survival outcomes consistent with modern oncological practice. The median post-operative survival was 12 months (95% CI: 0–49.5), with a mean survival of 31.38 months and a 1-year overall survival rate of 50.5% in our cohort, which aligns with survival durations reported in older studies, where median survival ranged from 6 to 12 months [12,13]. It is however important to consider disparities between studies, including variation in oncological therapies, selection bias, and the demographics and systemic disease burden of included patients.

The demographic characteristics of our cohort are consistent with those reported across multiple studies, including Lomas and Laba [13] and more recent analyses by Yaari et al. [14] and Zanaty and George [15]. However, unlike prostate-predominant series such as Bhanot et al. [16], our sample demographic was predominantly lung, breast, hematological, and renal malignancies. This tumor distribution is consistent with epidemiological patterns, as described by Cole and Patchell [1] and reinforced by guidelines from Loblaw and Laperriere [2].

Tumor histology emerged as the strongest predictor of post-operative survival in both univariate and multivariate analyses [6, 7, 12]. Patients with breast, thyroid, or hematological malignancies had comparatively prolonged survival, whereas lung, gastrointestinal, and esophageal cancers were associated with poorer outcomes. These results highlight that tumor biology, rather than radiological severity alone, is the dominant determinant of survival and underscore the importance of integrating clinical and imaging parameters for individualized prognostication.

Most patients in this series underwent decompression with stabilization, an approach well supported by the foundational work of Klimo and Schmidt [5] and validated in the Patchell trial [3], which showed improved outcomes for surgical decompression followed by radiotherapy. The variation in operative strategies including tumor debulking and fusion mirrors the heterogeneity described in modern surgical series such as those by Yaari et al. [14]. Although vertebroplasty and kyphoplasty were not used in our cohort, their efficacy for pain control in selected cases is supported by Sadeghi-Naini et al. [17].

The high proportion of patients presenting with Bilsky grade 3 compression suggests late presentation or aggressive tumor biology. This aligns with the challenges described in the



Oswestry disability index	N	N (censored)	Median survival time (months)	6-month survival (%)	12-month survival (%)	24-month survival (%)	60-month survival (%)
Minimal disability (reference)	3	3	72	61	61	61	55
Moderate disability	6	4	76.67	57	36	36	31
Severe disability	3	0	15	67	33	33	-
Crippled/Disabled	8	2	12	50	38	38	38
Bed-bound*	2	1	9	0	-	-	-

*Hazard ratio could not be computed due to the small sample size

Figure 9: Survival by Oswestry disability Index (n=22).

Table 2: Univariate Kaplan–Meier analysis of factors associated with survival					
Variable	**Patients (n)**	**Events (n)**	**Censored (n %)**	**Median survival (95% confidence interval/standard error)**	**P-value[a]**
Overall survival	45	27	18 (40.0)	12	
Surgical procedure					0.646
Standard decompression/stabilization	30	17	13 (43.3)	49.42 (0.0–99.5)	
Debulking/Extended decompression	9	7	2 (22.2)	11.0 (7.1–13.0)	
Complex/Reconstructive	6	3	3 (50.0)	5.5 (NR)	
Primary tumor histology					**0.006** *
Breast	8	3	5 (62.5)	NR	
Lung	9	7	2 (22.2)	6.0 (0.9–11.1)	
Myeloma	7	1	6 (85.7)	NR	
Renal	6	5	1 (16.7)	4.0 (0.0–14.8)	
Other[b]	15	11	4 (26.7)	12.0 (3.2–20.9)	
Epidural spinal cord compression					0.162
Low grade (Bilsky 0–1c)	18	8	10 (55.6)	72.0 (NR)	
High grade (Bilsky 2–3)	27	18	9 (33.3)	12.0 (9.6–14.4)	
Oswestry disability index	22	12	10 (45.5)	72.0 (±27.9)	**0.028***
Minimal disability	3	0	3 (100.0)	NR	
Moderate disability	6	2	4 (66.7)	72.0 (±41.53)	
Severe disability	3	3	0 (0.0)	12.0 (±9.3)	
Crippled/Disabled	8	6	2 (25.0)	9.0 (±5.7)	
Bed-bound	2	1	1 (50.0)	9.0 (±NR)	

NR: Not reached.

***Bold values are statistically significant at P<0.05 (Kaplan–Meier survival analysis). [a]Calculated using the log-rank (Mantel-Cox) test. [b]The "Other" category (n=15) consists of diverse malignancies with low individual frequencies, including prostate carcinoma (n=2), osteosarcoma (n=2), lymphoma (n=2), thyroid (n=2), and single cases of cervical, melanoma, liver, bladder, esophagus, colorectal, and head/neck carcinomas**

development of the SINS classification by Fisher et al. [18]. The importance of prompt diagnosis and intervention is reinforced by Rades et al., who showed improved neurological outcomes with earlier treatment [19].

Despite the severity of radiological compression, most patients remained neurologically intact on presentation, reflecting a dissociation between neuroimaging severity and neurological status, also observed by Fehlings et al. [12]. The post-operative improvements in functional status and pain scores in this cohort echo findings from Patchell et al. [3] and Choi et al. [7].

Notably, functional improvement and pain relief, as reflected in EQ-5D and ODI scores, reinforce that surgical intervention in metastatic spinal disease is primarily aimed at preserving meaningful life, even when survival may be limited. This may also suggest that preserved or improved functional capacity post-operatively may serve as a surrogate marker for systemic disease control and overall resilience.

The overall complication rate was low, with no perioperative deaths and a 30-day mortality of 4.3%. This reinforces that surgery for metastatic spinal disease can be performed safely in appropriately selected patients, particularly when conducted within a multidisciplinary framework involving oncology, radiology, and rehabilitation teams.

Limitations

This study has several important limitations that affect the interpretation and generalizability of its findings:

The cohort size was relatively small, limiting statistical power for subgroup analyses (e.g., by tumor type, Bilsky grade, or SINS category). Consequently, observed survival differences between diagnostic groups should be interpreted with caution.

As a single-center, single-surgeon series, the study is susceptible to selection and referral bias, which may limit external validity. Surgeon-specific decision-making, institutional practices, and local referral patterns may reduce generalizability to centers with different case mixes, resources, or surgical strategies.

Residual confounding is likely, as key prognostic variables including performance status, detailed systemic disease burden, post-operative neurological status, and specific oncological therapies, were incompletely captured. Functional outcome data (VAS and EQ-5D) were also incomplete and analyzed using complete-case methods, potentially affecting survival

Table 3: Functional outcomes: (EQ-5D VAS) (n=28)					
Outcome measure	**Pre-operative mean (SD)**	**Post-operative mean (SD)**	**Mean change (95% CI)**	**P-value[a]**	**Effect size (Cohen's d)[b]**
EQ-VAS	47.32 (23.51)	68.86 (22.06)	21.53 (10.85–32.21)	<0.001	0.78
EQ-5D index	0.17 (0.31)	0.56 (0.31)	0.38 (0.24–0.53)	<0.001	1.04

CI: Confidence interval, EQ-5D: EuroQol-5 dimension, SD: Standard deviation, VAS: Visual Analog Scale. [a]Calculated using paired samples t-test. [b]Effect size interpretation: 0.2, small; 0.5, medium; ≥0.8, large

estimates and the observed magnitude of functional improvement.

Some immortal time bias is unavoidable, since patients had to survive long enough to be referred, assessed, and undergo surgery. Therefore, survival estimates should be interpreted as reflecting outcomes in surgically selected patients discussed in a multidisciplinary setting, rather than all patients with metastatic spinal disease.

Conclusion

In this single-center, single-surgeon series, surgery for metastatic spinal disease, including cord compression, led to meaningful improvements in pain and health-related quality of life, with survival outcomes broadly consistent with previously reported surgical cohorts. These findings support the role of surgical intervention within a multidisciplinary approach for appropriately selected patients. However, the retrospective design, modest cohort size, and incomplete functional outcome data mean that the results should be interpreted as descriptive and hypothesis-generating.

Larger prospective, multi-center studies with standardized neurological, oncological, and patient-reported outcome measures are needed to better define prognostic factors and the incremental benefit of surgery.

Clinical Message

Metastatic spinal disease, including cord compression, is a time-critical emergency. Despite the modest cohort size, our data emphasize the importance of integrating tumor biology, functional status, and mechanical stability into surgical decision-making, and suggest that the primary aim of surgery is to relieve pain and improve quality of life rather than prolong survival.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

References

1. Cole JS, Patchell RA. Metastatic spinal cord compression: Epidemiology and clinical presentation. Clin Oncol (R Coll Radiol) 2009;21:753-9.

2. Loblaw DA, Laperriere NJ. Emergency treatment of malignant extradural spinal cord compression: An evidence-based guideline. J Clin Oncol 1998;16:1613-24.

3. Patchell RA, Tibbs PA, Regine WF, Payne R, Saris S, Kryscio RJ, et al. Direct decompressive surgical resection in the treatment of spinal cord compression caused by metastatic cancer: A randomised trial. Lancet 2005;366:643-8.

4. Zaikova O, Giercksky KE, Fosså SD, Kvaløy S, Johannesen TB, Skjeldal S. A population-based study of spinal metastatic disease in South-East Norway. Clin Oncol (R Coll Radiol) 2009;21:753-9.

5. Klimo P Jr., Schmidt MH. Surgical management of spinal metastases. Oncologist 2004;9:188-96.

6. Kim HJ, Park JS, Park SJ, Kang DH, Lee CS. Survival and prognostic factors after surgery in single spinal metastasis: Comparison of isolated-single spinal metastasis and single spinal metastasis with other metastasis. Glob Spine J 2024;15:2246-54.

7. Choi D, Fox Z, Albert T, Arts M, Balabaud L, Bünger C, et al. Prediction of quality of life and survival after surgery for symptomatic spinal metastases: A multicenter cohort study to determine suitability for surgical treatment. Neurosurgery 2015;77:698-708.

8. Roberts TT, Leonard GR, Cepela DJ. Classifications in brief: American spinal injury association (ASIA) impairment scale. Clin Orthop Relat Res 2017;475:1499-504.

9. Todd NV. Guidelines for cauda equina syndrome. Red flags and white flags. Systematic review and implications for triage. Br J Neurosurg 2017;31:336-9.

10. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004;240:205-13.

11. Copay AG, Glassman SD, Subach BR, Berven S, Schuler TC, Carreon LY. Minimum clinically important difference in lumbar spine surgery patients: A choice of methods using the oswestry disability index, medical outcomes study questionnaire short form 36, and pain scales. Spine J 2008;8:968-74.

12. Fehlings MG, Nater A, Tetreault L, Kopjar B, Arnold P, Dekutoski M, et al. Surgical management of metastatic spinal

cord compression: A systematic review. J Neurosurg Spine 2010;13:710-8.

13. Lomas MT, Laba TL. Outcomes of surgery for metastatic spinal cord compression: A 10-year institutional experience. Spine 2006;31:2424-9.

14. Yaari LS, Novack L, Shemesh S, Sidon E, Haviv B, Sheinis D, et al. Patient outcomes and survival following surgery for spinal metastases. J Spinal Cord Med 2021;44:204-11.

15. Zanaty A, George KJ. Outcomes and efficiency of managing patients admitted for surgery for spinal metastases. Surg Neurol Int 2022;13:312.

16. Bhanot K, Widdifield J, Huang A, Paterson JM, Shultz DB, Finkelstein J. Survival after surgery for spinal metastases: A population-based study. Can J Surg 2022;65:E512-8.

17. Sadeghi-Naini M, Aarabi S, Shokraneh F, Janani L, Vaccaro AR, Rahimi-Movaghar V. Vertebroplasty and kyphoplasty for metastatic spinal lesions: A systematic review. Clin Spine Surg 2018;31:203-10.

18. Fisher CG, DiPaola CP, Ryken TC, Bilsky MH, Shaffrey CI, Berven SH, et al. A novel classification system for spinal instability in neoplastic disease: An evidence-based approach and expert consensus from the spine oncology study group. Spine (Phila Pa 1976) 2010;35:E1221-9.

19. Rades D, Veninga T, Fehlauer F, Stalpers LJ, Schulte RW, Obralic N, et al. Prognostic factors and results of radiotherapy alone in metastatic spinal cord compression: A scoring system. Radiother Oncol 2008;87:197-203.

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