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Predictors of Outcomes and a Scoring System for Estimating Survival in Patients Treated With Radiotherapy for Metastatic Spinal Cord Compression From Small-Cell Lung Cancer

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Abstract

This study identified significant predictors for improvement of motor deficits, ambulatory status, and overall survival after radiotherapy of metastatic spinal cord compression (MSCC) from small-cell lung cancer (SCLC). Furthermore, a survival score was developed including 3 groups with 6-month survival rates of 0, 18%, and 77%, respectively. The predictive factors and the survival score can support physicians aiming to prescribe personalized treatments to patients with MSCC from SCLC.

Purpose: To identify prognostic factors and create a survival score to facilitate individualized care of patients with metastatic spinal cord compression (MSCC) from small-cell lung cancer (SCLC). **Patients and Methods:** Radiation regimen plus 9 factors were retrospectively evaluated in 120 patients irradiated for MSCC from SCLC for overall response, improvement of motor deficits, postradiotherapy ambulatory status, local control of MSCC, and overall survival (OS). Factors included age, interval diagnosis of SCLC to radiotherapy (RT) of MSCC, visceral metastases, further bone metastases, gender, time developing motor deficits, pre-RT ambulatory status, number of affected vertebrae, and Eastern Cooperative Oncology Group performance status (ECOG PS). **Results:** Improvement of motor deficits showed significant associations with ECOG PS 1-2 ($P = .018$); time developing motor deficits achieved borderline significance ($P = .059$). Post-RT ambulatory status was significantly associated with slower development of motor dysfunction ($P = .003$), ambulatory status ($P < .001$), and ECOG PS 1-2 ($P < .001$). No factor was significantly associated with overall response and local control. On multivariate analysis, OS was significantly associated with interval from SCLC diagnosis to RT of MSCC ($P = .004$), visceral metastases ($P < .001$), ambulatory status ($P = .002$), and ECOG PS ($P = .002$). For the survival score, 6-month OS rates related to each of these factors were divided by 10. Patient scores were obtained by adding these factors' scores. Three groups were defined (5, 7-13, and 15-17 points) with 6-month OS rates of 0, 18%, and 77%, respectively ($P < .001$). **Conclusion:** Predictors of various outcomes were identified and a survival score was created that can support physicians aiming to create personalized treatments to patients with MSCC from SCLC.

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Keywords: Metastatic spinal cord compression, Predictive factors, Small-cell lung cancer, Survival score, Treatment outcomes

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Introduction

Many patients with motor deficits due to metastatic spinal cord compression (MSCC) live only a few months.[1-4] However, some patients live considerably longer, some even for a few years. Radiotherapy (RT), either alone or preceded by decompressive neurosurgery, is the most common modality used for the treatment of MSCC.[1,2] Up-front neurosurgery is generally limited to patients with a good performance status, involvement of only one spinal segment by MSCC, and an estimated survival of at least 3 months.[5] These patients account for 10% to 15% of all patients with MSCC. Therefore, RT alone is the most common treatment for this incurable condition. When patients are assigned to RT, several dose-fractionation schedules are available, including single-fraction (eg, 1 × 8 Gy or 1 × 10 Gy) short-course multifraction (eg, 5 × 4 Gy or 5 × 5 Gy in 1 week), and longer-course (eg, 10 × 3 Gy in 2 weeks or 20 × 2 Gy in 4 weeks) programs.

Previous studies showed that the available dose-fractionation schedules are similarly effective with respect to improvement or maintaining motor function.[6-10] However, longer-course programs provide better local control of MSCC than single-fraction or short-course programs.[6,11] Local control gains importance with increasing lifetime after RT because local failure generally occurs several months

Table 1 OR to RT and Improvement of Motor Deficits After RT

	OR		Improvement	
Characteristic	**N (%)**	***P***	**N (%)**	***P***
Age				
≤65 y (n = 61)	46 (75)		10 (16)	
≥66 y (n = 59)	50 (85)	.57	15 (25)	.28
Interval From Diagnosis of SCLC to RT of MSCC				
≤15 mo (n = 98)	76 (78)		20 (20)	
>15 mo (n = 22)	20 (91)	.53	5 (23)	.84
Visceral Metastases				
No (n = 43)	34 (79)		9 (21)	
Yes (n = 77)	62 (81)	.93	16 (21)	.99
Further Bone Metastases				
No (n = 41)	33 (80)		8 (20)	
Yes (n = 79)	63 (80)	.97	17 (22)	.83
Gender				
Female (n = 32)	25 (78)		7 (22)	
Male (n = 88)	71 (81)	.89	18 (20)	.89
Time to Development of Motor Deficits				
≤7 d (n = 47)	31 (66)		5 (11)	
8-14 d (n = 35)	32 (91)		7 (20)	
>14 d (n = 38)	63 (87)	.38	13 (34)	.059
Ambulatory Status Before RT				
Not ambulatory (n = 53)	39 (74)		9 (17)	
Ambulatory (n = 67)	57 (85)	.49	16 (24)	.42
No. of Involved Vertebrae				
1-2 (n = 50)	42 (84)		12 (24)	
≥3 (n = 70)	54 (77)	.68	13 (19)	.52
ECOG PS				
1-2 (n = 49)	44 (90)		16 (33)	
3-4 (n = 71)	52 (73)	.32	9 (13)	.018[b]
RT Regimen				
Short course (n = 55)	43 (78)		9 (16)	
Long course (n = 65)[a]	53 (82)	.84	16 (25)	.32
Entire cohort	96 (80)		25 (21)	

Abbreviations: ECOG PS = Eastern Cooperative Oncology Group performance status; MSCC = metastatic spinal cord compression; OR = odds ratio; RT = radiotherapy; SCLC = small-cell lung cancer.
[a]OR and improvement rates of subgroup of patients (n = 32) receiving > 30 Gy were 81% and 25%, respectively.
[b]Statistically significant.

Table 2 Ambulatory Rates After RT

Characteristic	N (%)	*P*
Age		
≤65 y (n = 61)	36 (59)	
≥66 y (n = 59)	36 (61)	.89
Interval From Diagnosis of SCLC to RT of MSCC		
≤15 mo (n = 98)	56 (57)	
>15 mo (n = 22)	16 (73)	.39
Visceral Metastases		
No (n = 43)	26 (60)	
Yes (n = 77)	46 (60)	.96
Further Bone Metastases		
No (n = 41)	25 (61)	
Yes (n = 79)	47 (59)	.92
Gender		
Female (n = 32)	18 (56)	
Male (n = 88)	54 (61)	.75
Time Developing Motor Deficits		
≤7 d (n = 47)	14 (30)	
8-14 d (n = 35)	27 (77)	
>14 d (n = 38)	31 (82)	.003[b]
Ambulatory Status Before RT		
Not ambulatory (n = 53)	9 (17)	
Ambulatory (n = 67)	63 (94)	<.001[b]
No. of Involved Vertebrae		
1-2 (n = 50)	32 (64)	
≥3 (n = 70)	40 (57)	.63
ECOG PS		
1-2 (n = 49)	46 (94)	
3-4 (n = 71)	26 (37)	<.001[b]
RT Regimen		
Short course (n = 55)	32 (58)	
Long course (n = 65)[a]	40 (62)	.81
Entire cohort	72 (60)	

Abbreviations: ECOG PS = Eastern Cooperative Oncology Group performance status; MSCC = metastatic spinal cord compression; RT = radiotherapy; SCLC = small-cell lung cancer.
[a]Post-RT ambulatory rate of subgroup of patients (n = 32) receiving > 30 Gy was 56%.
[b]Statistically significant.

or later after treatment.[12] Moreover, a previous matched-pair study suggested that in patients with a favorable survival prognosis 15 × 2.5 Gy in 3 weeks and 20 × 2 Gy in 4 weeks resulted in better local control and survival than 10 × 3 Gy in 2 weeks.[13] Taking into account the results from the available studies, patients with a short estimated life span should receive single-fraction or short-course RT, patients with an intermediate prognosis appear good candidates for 10 × 3 Gy, and patients with a favorable survival prognosis should receive longer-course RT with 37.5 to 40.0 Gy provided over 3 to 4 weeks.[1,3,4,6-13] Thus, it is important to estimate an individual patient's survival prognosis as precisely as possible before beginning treatment to select the most appropriate RT program. Treatment decisions can be facilitated by identifying significant predictors of survival and using scoring tools to estimate a patient's life span.

Other important end points of the treatment of MSCC include response to RT, improvement of motor function, and post-RT ambulatory status. Prognostic factors can help identify patients who are unlikely to benefit from RT alone, ie, patients whose disease will not respond to RT or who will not retain the ability to walk. These patients may be considered for up-front neurosurgery even if they do not meet the criteria stated above.[5]

It is generally agreed that it would be helpful to rely on specific prognostic factors and a survival score for each tumor entity associated with MSCC because they vary with respect to biological behavior, radiosensitivity, and prognoses.[1-4] Identification of prognostic factors and development of a survival score have already been realized for several primary tumor types, including non–small-cell lung cancer (NSCLC), but not for small-cell lung cancer (SCLC).[14] The present study was performed to fill this gap and to lead to improvements in personalized care.

Patients and Methods

This retrospective study includes 120 patients who received RT alone for MSCC between 1996 and 2016. The radiation regimen plus 9 pretreatment clinical factors were evaluated for potential associations with overall response (defined as improvement or at least no further progression of motor deficits), improvement of motor deficits, ambulatory status, local control (freedom from an in-field recurrence of MSCC), and overall survival (OS). The patients received either short-course RT with 8 Gy in 1 fraction (n = 13) or 20 Gy in 5 fractions over 1 week (n = 42) or longer-course RT with 30 Gy in 10 fractions over 2 weeks (n = 33), 35 to 37.5 Gy in 14 to 15 fractions over 3 weeks (n = 18), or 40 Gy in 20 fractions over 4 weeks (n = 14). RT was performed with 6 to 18 MeV photon beams from a linear accelerator. Treatment volumes generally encompassed the vertebrae affected by MSCC plus one vertebra above and below the affected ones. Radiation doses were prescribed to the posterior margin of the vertebral body.

The 9 pretreatment clinical factors investigated in addition to the radiation regimen included age at the time of RT (≤ 65 vs. ≥ 66 years; median age, 65 years), interval between first diagnosis of SCLC and RT of MSCC (≤ 15 vs. > 15 months[12]), visceral metastases (no vs. yes) or presence of other bone metastases (no vs. yes), gender, time developing motor dysfunction (≤ 7 vs. 8-14 vs. > 14 days[6]), ability to walk (no vs. yes), number of vertebrae affected by MSCC (1-2 vs. ≥ 3[12]), and performance status (PS) according to the Eastern Cooperative Oncology Group (ECOG; 1-2 vs. 3-4). The treatment outcomes investigated included overall response, improvement of motor deficits, ambulatory status, local control of MSCC, and OS. Motor function was evaluated before and directly after RT, and at 1 month, 3 months, and 6 months after the treatment. It was rated with a scale of 0 to 4 points, as follows: 0 = normal strength, 1 = ambulatory without aid, 2 = ambulatory with aid, 3 = not ambulatory, 4 = completely paraplegic.[15] Improvement and deterioration of motor deficits were defined as a change of at least one point on this scale. For overall response, the best response to RT up to 3 months after treatment was recorded. For the analyses of local control, only patients who experienced a favorable response to RT were considered. Local control and OS times were referenced from the first day of RT.

Table 3 Local Control of MSCC up to 12 Months After RT

Characteristic	3 Months (%)	6 Months (%)	9 Months (%)	12 Months (%)	*P*
Age					
≤65 y (n = 46)	100	91	91	91	
≥66 y (n = 50)	95	95	88	88	.78
Interval From Diagnosis of SCLC to RT of MSCC					
≤15 mo (n = 76)	96	90	90	90	
>15 mo (n = 20)	100	100	89	89	.65
Visceral Metastases					
No (n = 34)	97	89	89	89	
Yes (n = 62)	98	98	86	86	.67
Further Bone Metastases					
No (n = 33)	97	91	91	91	
Yes (n = 63)	98	94	87	87	.98
Gender					
Female (n = 25)	100	93	77	77	
Male (n = 71)	96	93	93	93	.61
Time Developing Motor Deficits					
≤7 d (n = 31)	95	95	76	76	
8-14 d (n = 32)	100	94	94	94	
>14 d (n = 33)	96	91	91	91	.62
Ambulatory Status Before RT					
Not ambulatory (n = 39)	96	88	59	59	
Ambulatory (n = 57)	98	95	95	95	.09
No. of Involved Vertebrae					
1-2 (n = 42)	97	97	97	97	
≥3 (n = 54)	98	90	81	81	.22
ECOG PS					
1-2 (n = 44)	98	94	94	94	
3-4 (n = 52)	97	91	76	76	.32
RT Regimen					
Short course (n = 43)	100	93	93	93	
Long course (n = 53)[a]	95	92	86	86	.45
Entire cohort	97	93	89	89	

Abbreviations: ECOG PS = Eastern Cooperative Oncology Group performance status; MSCC = metastatic spinal cord compression; RT = radiotherapy; SCLC = small-cell lung cancer.
[a]Local control rates of subgroup of patients (n = 26) receiving > 30 Gy were 100%, 94%, 88%, and 88%, respectively.

Statistical analyses for overall response, improvement of motor function, and ambulatory status after RT were performed with the chi-square test. $P < .05$ was considered statistically significant. Local control and OS were performed by the Kaplan-Meier method.[16] The Kaplan-Meier curves were compared by the log-rank test for the univariate analysis. The factors found to be significantly associated with local control or OS with the log-rank test were included in a multivariate analysis (Cox regression model). The factors significantly associated with OS on both univariate and multivariate analyses were used to create a scoring system for estimating OS.

Results

Patients were followed until death or for at least 6 months after RT. Median follow-up times were 4 months (range, 0-22 months) in the entire cohort and 12 months (range, 6-14 months) in surviving patients. In the entire series, 96 patients (50%) had disease that responded to RT (= overall response). Overall response was not significantly associated with any of the investigated factors, including the RT regimen ($P = .84$) (Table 1). Improvement of motor deficits after RT occurred in 25 patients (21%) and was associated with better pretreatment PS (ECOG PS 1-2; $P = .018$). In addition, slower development of motor dysfunction before RT (> 14 days) achieved borderline significance ($P = .059$) (Table 1). The RT regimen had no significant impact on the improvement rate ($P = .32$). Of those 21 patients with an ECOG PS of 1-2 and a slower development of motor deficits, 9 patients (43%) showed improvement of motor dysfunction. In contrast, only 5% (2/39) of the patients with an ECOG PS of 3-4 and a fast development of motor deficits (≤ 7 days) improved.

In the entire series, 72 patients (60%) were ambulatory after RT. Of the 53 patients who were not ambulatory before RT, 9 patients (17%) regained their walking ability, and of those 67

Table 4 Overall Survival up to 12 Months After RT

Characteristic	3 Months (%)	6 Months (%)	9 Months (%)	12 Months (%)	*P*
Age					
≤65 y (n = 61)	48	26	7	7	
≥66 y (n = 59)	66	24	18	10	.23
Interval From Diagnosis of SCLC to RT of MSCC					
≤15 mo (n = 98)	52	21	8	7	
>15 mo (n = 22)	77	41	32	16	.016[b]
Visceral Metastases					
No (n = 43)	74	47	26	23	
Yes (n = 77)	47	13	6	1	<.001[b]
Further Bone Metastases					
No (n = 41)	66	29	12	5	
Yes (n = 79)	52	23	14	12	.82
Gender					
Female (n = 32)	63	22	6	3	
Male (n = 88)	55	26	16	11	.69
Time Developing Motor Deficits					
≤7 d (n = 47)	38	11	6	4	
8-14 d (n = 35)	63	29	16	8	
>14 d (n = 38)	74	39	18	14	.003[b]
Ambulatory Status Before RT					
Not ambulatory (n = 53)	34	8	6	2	
Ambulatory (n = 67)	75	39	18	15	<.001[b]
No. of Involved Vertebrae					
1-2 (n = 50)	64	32	17	8	
≥3 (n = 70)	51	20	10	8	.31
ECOG PS					
1-2 (n = 49)	80	43	23	21	
3-4 (n = 71)	41	13	6	1	<.001[b]
RT Regimen					
Short course (n = 55)	44	20	10	10	
Long course RT (n = 65)[a]	68	29	15	7	.22
Entire cohort	57	25	13	9	

Abbreviations: ECOG PS = Eastern Cooperative Oncology Group performance status; MSCC = metastatic spinal cord compression; RT = radiotherapy; SCLC = small-cell lung cancer.
[a]OS rates of subgroup of patients (n = 32) receiving > 30 Gy were 81%, 31%, 25%, and 6%, respectively.
[b]Statistically significant.

patients who were ambulatory, 63 patients (94%) maintained the ability to walk. Ambulatory status after RT was significantly associated with slower development of motor dysfunction before RT ($P = .003$), pretreatment ambulatory status ($P < .001$), and a better PS (ECOG PS 1-2; $P < .001$), but not with the RT regimen ($P = .81$) (Table 2). Of those 19 patients with an ECOG PS of 1-2, slower development of motor deficits, and ability to walk before RT, 18 patients (95%) were able to walk after RT, compared to only 6% (2/33) of those patients with an ECOG PS of 3-4, fast development of motor deficits (≤ 7 days), and inability to walk before RT.

The local control rates of MSCC were 97%, 93%, 89%, and 89%, at 3, 6, 9, and 12 months, respectively. On univariate analysis, significant associations between local control and the investigated factors including the RT regimen ($P = .45$) were not found (Table 3). Therefore, a multivariate analysis was not performed for local control of MSCC.

For the entire cohort, median OS time was 4 months, and OS rates at 3, 6, 9, and 12 months were 57%, 25%, 13%, and 9%, respectively. On univariate analysis, better OS was significantly associated with a longer interval (> 15 months) between first diagnosis of SCLC and RT of MSCC ($P = .016$), absence of visceral metastases ($P < .001$), slower development (> 14 days) of motor deficits before RT ($P = .003$), ambulatory status before RT ($P < .001$), and better PS (ECOG PS 1-2; $P < .001$), but not with the RT regimen ($P = .22$; Table 4). These 5 factors were included in the multivariate analyses, where the interval between first diagnosis of SCLC and RT of MSCC (risk ratio [RR] = 1.46, 95% confidence interval [CI], 1.12-1.94; $P = .004$), visceral metastases (RR = 2.46; 95% CI, 1.61-3.83; $P < .001$), ambulatory status

Table 5 Six-Month OS Rates of Factor Scores

Prognostic Factor	OS at 6 Months (%)	Factor Scores
Interval from diagnosis of SCLC to RT of MSCC		
≤15 mo (n = 98)	21	2
>15 mo (n = 22)	41	4
Visceral Metastases		
No (n = 43)	47	5
Yes (n = 77)	13	1
Ambulatory Status Before RT		
Not ambulatory (n = 53)	8	1
Ambulatory (n = 67)	39	4
ECOG PS		
1-2 (n = 49)	43	4
3-4 (n = 71)	13	1

Abbreviations: ECOG PS = Eastern Cooperative Oncology Group performance status; MSCC = metastatic spinal cord compression; OS = overall survival; RT = radiotherapy; SCLC = small-cell lung cancer.

before RT (RR = 1.99; 95% CI, 1.30-3.04; $P = .002$), and ECOG PS (RR = 2.03; 95% CI, 1.31-3.17; $P = .002$) were significant. In contrast, the time developing motor deficits before RT was not significant in the multivariate analysis (RR = 1.21; 95% CI, 0.94-1.56; $P = .15$).

On the basis of the 4 prognostic factors, interval between first diagnosis of SCLC and RT of MSCC, visceral metastases, ambulatory status before RT, and ECOG PS, the scoring tool for estimating OS was developed. For each patient, the 6-month OS rates of each factor (in percentages) were divided by 10 to create a subscore for that factor (factor score). The factor scores are shown in Table 5. Subsequently, the factor scores were added, and the scores for individual patients were obtained (patient scores). The patient scores ranged between 5 and 17 points; the 6-month OS rates of the patient scores are illustrated in Figure 1.

On the basis of the patient scores, 3 prognostic groups were defined: 5 points (n = 27), 7-13 points (n = 71), and 15-17 points (n = 22). The corresponding 6-month OS rates were 0, 18%, and 77%, respectively, and the median OS times were 2 months, 4 months, and 9 months, respectively (Figure 2; $P < .001$).

Discussion

MSCC is often an emergency occurring in 5% to 10% of adult patients with a solid tumor.[1,2] RT is the most frequently applied treatment modality for MSCC. When aiming to select the best radiation program, physicians generally agree that patients with a short remaining life span should receive a single-fraction or a short-course multifraction regimen. Because these regimes are generally not inferior to longer-course regimens regarding improvement of motor deficits and prevention of further progression of symptoms, they would be particularly appropriate for patients with poor survival in order to avoid spending more time than necessary receiving RT.[6-10] In contrast, longer-course RT programs lead to significantly improved local control of MSCC compared to single-fraction or short-course multifraction programs.[6,11] Patients with MSCC and a favorable survival prognosis were reported to benefit from total radiation doses beyond 30.0 Gy. In a study of 382 patients with MSCC from different primary tumor types and favorable survival prognoses, patients treated with 30.0 Gy in 10 fractions (n = 191) were matched to 191 patients treated with 37.5 Gy in 15 fractions or 40.0 Gy in 20 fractions for 10 strata.[13] Patients receiving 37.5 or 40.0 Gy experienced significantly better local control of MSCC ($P = .012$) and survival ($P = .013$). To avoid over- or under-treatment, it would be helpful to predict the remaining lifetime of patients with MSCC. Several studies have identified predictors of survival and scoring systems for estimating survival of these patients.[3,4] In order to account for the specific behaviors of the different primary tumor types associated with MSCC, significant predictors and scoring systems were provided separately for several tumor types, including NSCLC.[14] However, until the present study, a scoring system had not been reported for SCLC.

In the present cohort of 120 SCLC patients with MSCC, 4 predictors of survival—interval between first diagnosis of SCLC and RT of MSCC, visceral metastases, ambulatory status before RT, and ECOG PS—were identified. On the basis of these factors, a scoring system was created with 3 groups each having significantly different survival rates. Of those patients with only 5 points, no patient survived as long as 6 months, and the median OS time was only 2 months. Therefore, these patients should preferably receive single-fraction or short-course multifraction RT.[7-10] For selected patients, best supportive care alone may also be a reasonable option. In the group of patients with 7 to 13 points, 18% survived for at least 6 months, and the median survival time was 4 months. Thus, the prognosis of these patients may be considered intermediate. Previous studies not

Figure 1 Patient Scores and Corresponding 6-Month Survival Rates

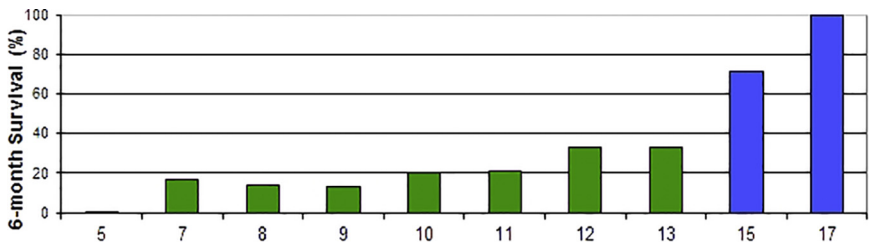
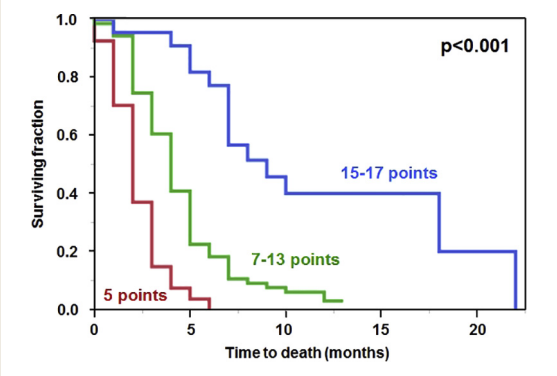


Figure 2 Kaplan-Meier Curves of Prognostic Groups



particularly focusing on MSCC from SCLC recommend RT with 10 × 3 Gy in 2 weeks or short-course multifraction RT with 5 × 4 Gy in 1 week for this group of patients.[1-4] However, those studies were performed in patients with MSCC from various tumor entities, mostly from NSCLC, breast cancer, and prostate cancer. Compared to other solid tumors, SCLC is considered more radiosensitive.[1,2] Therefore, the recommendation of using 10 × 3 Gy in 2 weeks may not apply to MSCC from SCLC. In the present study, short-course RT, which was 5 × 4 Gy in 1 week in the majority of these patients, was not significantly worse than longer-course RT with respect to all investigated end points, including local control of MSCC and OS. In fact, the absolute numbers suggested a better long-term local control with short-course RT, although statistical significance was not reached. Thus, patients in the 7 to 13 points group appeared well treated with 5 × 4 Gy in 1 week and likely do not require longer-course RT.

Patients who had 15 to 17 points had the most favorable survival prognosis, with a 6-month OS rate of 77% and a median OS time of 9 months. According to a previous study, these patients appear to be good candidates for longer-course RT with total doses beyond 30 Gy—for example, 37.5 Gy in 15 fractions or 40.0 Gy in 20 fractions.[13] However, this previous study included patients with MSCC from different primary tumor types. In the present study, the subgroup of patients receiving doses beyond 30 Gy did not experience better outcomes than those patients receiving short-course RT with respect to overall response, improvement of motor deficits, post-RT ambulatory status, and long-term local control of MSCC. OS at 3, 6, and 9 months after RT was better after longer-course RT with doses beyond 30 Gy than after short-course RT. However, this finding may be a result of a selection bias because physicians tend to use longer-course RT in patients with longer expected survival times. In general, when interpreting the results of the present study, one should be aware that it is a retrospective study, which may include hidden selection biases.

In addition to OS, this study aimed to identify prognostic factors for other outcomes, including overall response, improvement of motor deficits, post-RT ambulatory status, and local control of MSCC. Improvement of motor deficits was significantly associated with ECOG PSs of 1 to 2, and almost significantly associated with a slower (> 14 days) development of motor deficits before RT. In addition, post-RT ambulatory status was significantly associated with time developing motor deficits, pretreatment ambulatory status, and ECOG PS. Thus, patients with a fast development of motor deficits, patients with ECOG PS of 3 to 4, and patients who are not ambulatory before RT do not sufficiently benefit from RT alone. This is particularly true for patients who meet all the negative criteria. A randomized trial demonstrated that up-front neurosurgery in addition to RT led to a significantly higher rate of post-treatment ambulatory status in properly selected patients.[5] Thus, in particular patients with MSCC from SCLC who experience fast development of motor deficits and/or are not ambulatory before RT should be seen up-front by the neurologic or orthopedic surgeon.

In conclusion, a scoring instrument was created that enables treating physicians to estimate the OS of SCLC patients with MSCC to help select the optimal radiation program for an individual patient. Moreover, significant predictors of improvement of motor deficits and post-RT ambulatory status were identified that can help identify patients who would benefit from up-front surgery in addition to RT.

Clinical Practice Points

- Patients with MSCC from SCLC assigned to RT require individualized treatment. Personalization of treatment can be facilitated with knowledge of prognostic factors.
- This study identified significant predictors for outcomes after RT of MSCC from SCLC. In addition, a survival score was developed.
- The predictive factors and the survival score can support physician selection of optimal personalized treatment of these patients.

Disclosure

The authors have stated that they have no conflict of interest.

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