Open Journal of Modern Neurosurgery, 2014, 4, 110-120
Published Online July 2014 in SciRes. http://www.scirp.org/journal/ojmn
http://dx.doi.org/10.4236/ojmn.2014.43020

Metastatic Spinal Cord Compression (MSCC) —The Evolving Story from Kashmir*

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Received 1 April 2014; revised 1 May 2014; accepted 1 June 2014

Abstract

Aim: To know the demographics of the patients most commonly involved by metastatic cord compression in Kashmir and to find the commonest primary organ to metastasize to spine causing cord compression. Methods: A hospital-based 10-year retro-prospective study was carried out in the Department of Neurosurgery of Sher-i-Kashmir Institute of Medical Sciences, Soura from July 2002 to June 2012, which is the premier tertiary care institute of the Kashmir valley. Patients were evaluated for metastatic spinal cord compression based on a standard proforma and specialized investigations were carried out and were deemed necessary by the concerned neurosurgical unit. Results: The commonest primary malignancy to metastasize to the spinal column in our study was Non-Hodgkin's lymphoma, followed in turn by metastatic squamous cell carcinoma lung, metastatic intraductal carcinoma breast and metastatic adenocarcinoma prostate. Predominantly dorsal spine was the commonest region of spine involved by MSCC. Conclusion: Metastatic spinal cord compression is coming up in a big way. As the long-term cancer survivors increase due to multi-modality treatment protocols aimed at treating cancers and prolonging survival, there will be a proportionate increase in the number of patients who will potentially land up in metastatic spinal cord compression.

Keywords

Spinal Cord Compression, Metastasis, Primary Organ

*No grants were needed for carrying out this research. This was a hospital based study which was carried out in the Department of Neurosurgery, SKIMS. Records were searched for based on the database maintained by the Medical Records Department of our Institute. Each of the authors has contributed to this research and prior permission of each author has been sought before this manuscript has been sent for publication.
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How to cite this paper: Mir, S.F., Bhat, A.R., Reshi, S.F. and Kirmani, A.R. (2014) Metastatic Spinal Cord Compression (MSCC)—The Evolving Story from Kashmir. *Open Journal of Modern Neurosurgery*, **4**, 110-120.
http://dx.doi.org/10.4236/ojmn.2014.43020

1. Introduction

Spinal cord compression occurs due to displacement of the part or whole of the spinal cord. The causes of compression are tumor, fracture, metastasis, abscess, prolapsed intervertebral disc or other lesions. Metastatic spinal cord compression (MSCC) is a well-recognized complication of cancer and is usually an oncological emergency. MSCC was first described by Spiller in 1925 as progressive paraplegia in cancer patients [1]. The true incidence of MSCC is unknown and post-mortem evidence indicates that it is present in 5% - 10% of patients with advanced cancer. It is likely that the incidence of MSCC will increase in the future with improving cancer treatments resulting in better survival and outcomes. Lung, breast and prostate cancers are the commonest malignancies causing MSCC and account for over 50% of cases [1] [2], but it can also be caused by any primary tumour. In 7% of patients the site of primary tumour may remain unidentified [2] [3]. Three mechanisms are responsible for MSCC, the commonest being haematogenous spread to the vertebral spine causing collapse and compression, accounting for over 85% of cases [2] [4]. The risk of MSCC is also proportionally related to the duration of disease and therefore, as cancer survival time increases, so might also be the incidence of MSCC. MSCC occurs when there is pathological vertebral body collapse or direct tumour growth causing compression of the spinal cord or cauda equina. Early diagnosis and treatment are essential to prevent neurological damage and to achieve this, early recognition and reporting of symptoms, quick referral, prompt and appropriate investigations and prompt treatment are needed. Therefore it is important that the patients with malignancy and all health care professionals are aware of the early symptoms and signs of MSCC [1] [3]-[5]. Unfortunately, the symptoms and signs that are usually taught are those of established MSCC such as weakness of the limbs, bladder and bowel dysfunction and sensory loss. There is a significant association between the ability to walk at the time of diagnosis and the ability to walk following treatment [6]-[9]. Malignant spinal cord compression (MSCC) is a common oncological emergency that requires immediate treatment to relieve pain and preserve neurological function [4]. It is a major cause of morbidity in oncology patients [10]. The effects of MSCC can range from minor sensory, motor and autonomic changes to severe pain and complete paralysis that significantly affects a patient's quality of life, and in patients with back pain and a history of cancer, a high degree of suspicion is necessary to ensure an early diagnosis [11]. The key investigation for the diagnosis of MSCC is magnetic resonance imaging (MRI) of the whole spine [2] [12].

2. Aims & Objectives

1) To know the demographics of the patients most commonly involved by the disease in Kashmir.
2) To ascertain the sensitivity and specificity of MRI/CT scan in relation to clinical findings.
3) To find the commonest organ with primary disease to cause MSCC.
4) To know the commonest treatment modality employed for dealing with the disease.

3. Material & Methods

We undertook a retro-prospective hospital based study from July 2002 to June 2012. The patients were admitted in the Department of Neurosurgery, SKIMS during the study period. The patients were evaluated during hospitalization and were subjected to routine and specialized work up. A detailed history was taken including age, sex, residence and presenting complaints with emphasis on pain back/spine, weakness of lower limbs, urinary incontinence, fecal incontinence, dysaesthesia and smoking. A thorough physical examination was done with special emphasis on level of consciousness using standard Glasgow Coma scale, cranial nerve assessment, motor power of upper and lower limbs, loss of sensations, local spinal tenderness, gibbus and gait. Base line investigations including complete blood count, kidney function tests, liver function tests, electrocardiogram, coagulogram and chest X-ray were performed. USG abdomen was performed to rule out visceral metastasis or primary disease in the abdomen. Local spinal X-ray was done to look for any vertebral compression. Specialized tests were done, as per the clinical suspicion, as regards the underlying disease.

Once cord compression was suspected, CT scan/MRI study of the spine was undertaken after taking valid informed consent from the guardian or care taker. The vertebral level of cord compression and the degree of compression was noted. A thorough search was made to locate the primary disease in those with spinal metastases. If after detailed metastatic work up, the primary could not be located, then only was the patient labeled to have an occult primary disease.

4. Exclusion Criteria

Metastasis involving the cal sac below lower border of L_1 in adults.

5. Observations & Results

A total of 46 patients of metastatic spinal cord compression, who were admitted and evaluated in the Department of Neurosurgery over a period of ten years from July 2002 to June 2012, were included in the study. The important observations made were as follows.

It was observed that majority of the patients in this study were males, with the commonest age group involved was of patients' ≥60 years; with a mean age of 46.16 years (**Table 1**).

Metastatic cord compression was commoner in rural population as they formed a major chunk of our state's population and they do not have an easy access to tertiary health care. Incidence increased with age and one-third of patient's were >60 years of age (**Table 2**).

50.79% patients had history suggestive of smoking. More than one symptom was seen in all of the patients on presentation. None of the patients we studied had signs of cerebellar involvement. Cranial nerve examination was normal in all patients at time of presentation (**Table 3**).

Occupational trends followed the general trends in the population and no subset of the population was particularly susceptible (**Table 4**).

Upper limb power was predominantly Grade IV and Grade V; no patient had Grade I power in upper limbs. Lower limb power at time of admission was predominantly Grade III and Grade IV; only one patient had Grade V power in lower limbs at presentation (**Table 5**).

MRI was the diagnostic modality employed in nearly 82.61% patients, either alone or in combination with CT scanning. CT scan alone was used only in 17.39% patients (**Table 6**).

The commonest primary malignancy to metastasize amongst males was lung malignancy in 9 (31.03%) patients. Amongst females, the commonest primary malignancy to metastasize was breast malignancy in 8 patients, which accounted for 47.06% of metastatic tumors amongst females (**Table 7**).

In our study, cord compression involved one region of spine in 82.60%, two regions of spine in 17.40% patients (**Table 8**).

The commonest primary malignancy to metastasize to the spine was Non-Hodgkin's lymphoma in 11 (23.91%) patients, followed in turn by lung malignancy in 10 (21.74%) patients, breast malignancy in 8 (17.39%) patients and prostatic carcinoma in 6 (13.04%) patients (**Table 9**).

The commonest numbers of lesions of the spinal column were two, which were seen in 14 (30.44%) patients. A single lesion occurred in 12 (26.08%) patients, whereas multiple lesions involving several vertebral bodies were seen in 8 (17.39%) patients (**Table 10**).

Commonest histo-pathological variant was Non-Hodgkin's lymphoma followed in turn by metastatic squamous cell carcinoma and metastatic intraductal carcinoma. Histopathology was inconclusive in one patient (**Table 11**).

The standard procedure performed was a laminectomy followed by a procedure for stabilization of the spine. 4 patients were deemed to be too frail to withstand a surgical procedure (**Table 12**).

Table 1. Age and gender distribution of MSCC patients.

Age (Years)	Gender				Total	
	Male		Female			
	n	%	N	%	N	%
0 to 9	0	0.00	0	0.00	0	0.00
10 to 19	1	3.57	0	0.00	1	2.17
20 to 29	2	7.14	3	16.67	5	10.87
30 to 39	5	17.86	2	11.11	7	15.22
40 to 49	4	14.29	4	22.22	8	17.39
50 to 59	6	21.43	3	16.67	9	19.57
≥60	10	35.71	6	33.33	16	34.78
Total	28	60.87	18	39.13	46	100.00
p Value			0.438 (NS)			

Table 2. Age and dwelling distribution of MSCC patients.

Age (Years)	Dwelling				Total	
	Rural		Urban			
	n	%	N	%	n	%
0 to 9	0	0.00	0	0.00	0	0.00
10 to 19	1	2.78	0	0.00	1	2.17
20 to 29	4	11.11	1	10.00	5	10.87
30 to 39	5	13.89	2	20.00	7	15.22
40 to 49	5	13.89	3	30.00	8	17.39
50 to 59	8	22.22	1	10.00	9	19.57
≥60	13	36.11	3	30.00	16	34.78
Total	36	78.26	10	21.74	46	100.00
p Value	0.012 (Sig)					

Table 3. Age and dwelling distribution of MSCC patients.

Presentation	N	%
Symptoms		
Pain Neck/Back	43	93.45
Weakness of Lower Limbs	42	91.30
Dysaesthesia	30	65.22
Urinary Incontinence	21	45.65
Fecal Incontinence	11	23.91
Signs		
Local Spinal Tenderness	38	82.61
Paraparesis	37	80.44
Loss of Sensations	31	67.39
Gibbus	14	30.44

Table 4. Occupational distribution of MSCC patients.

Occupation	n	%
Unemployed/Household Work	16	34.78
Farmer	12	26.09
Government Employee	8	17.39
Carpet Weaver	6	13.04
Student	3	6.52
Labourer	1	2.17
Total	46	100.00

Table 5. Motor power of MSCC patients.

Power	Upper Limb		Lower Limb	
	N	%	N	%
Grade I	0	0.00	2	4.35
Grade II	3	6.52	11	23.91
Grade III	7	15.22	20	43.48
Grade IV	19	41.30	12	26.09
Grade V	17	36.96	1	2.17
p Value	0.001 (Sig)			

Table 6. Comparison of imaging modalities used for diagnosis.

Imaging Modality	n	%
CT Scan Alone	8	17.39
MRI Alone	32	69.56
CT + MRI	6	13.05

Table 7. Sex and primary organ of cancer in MSCC patients.

Primary Organ of Cancer	Males		Females		Total	
	N	%	n	%	n	%
Thyroid	0	0.00	4	23.53	4	8.70
Breast	0	0.00	8	47.06	8	17.39
Lung	9	31.03	1	5.88	10	21.74
Prostate	6	20.69	0	0.00	6	13.04
Testis	3	10.34	0	0.00	3	6.52
Urinary Bladder	1	3.45	0	0.00	1	2.18
Non-Hodgkin's Lymphoma	8	27.59	3	17.65	11	23.91
Occult Primary	2	6.90	1	5.88	3	6.52
Total	29	63.04	17	36.96	46	100.00
p Value			0.001 (Sig)			

Table 8. Vertebral level involved by metastatic spinal lesions causing spinal cord compression.

Level of Lesion	Metastatic Spinal Cord Lesion	
	n	%
Cervical Spine	8	17.39
Cervico-Dorsal Spine	3	6.52
Dorsal Spine	29	63.04
Dorso-Lumbar Spine	5	10.87
Lumbar Spine	1	2.17
Total	46	100.00

Table 9. Sex and primary organ of cancer in MSCC patients.

Primary Organ of Cancer	Males		Females		Total
	n	%	n	%	n
Thyroid	0	0.00	4	23.53	4
Breast	0	0.00	8	47.06	8
Lung	9	31.03	1	5.88	10
Prostate	6	20.69	0	0.00	6
Testis	3	10.34	0	0.00	3
Urinary Bladder	1	3.45	0	0.00	1
Non-Hodgkin's Lymphoma	8	27.59	3	17.65	11
Occult Primary	2	6.90	1	5.88	3
Total	29	63.04	17	36.96	46
p Value			0.001 (Sig)		

Table 10. Number of spinal lesions in MSCC patients.

Number of Lesions	No of Patients	%
1	12	26.08
2	14	30.44
3	8	17.39
4	4	8.70
Multiple Lesions	8	17.39
Total	46	100.00

Table 11. Histopathological examination of metastatic spinal cord compression.

Histopathology	N	%
Non-Hodgkin's Lymphoma	11	23.91
Metastatic Squamous Cell Carcinoma	10	21.74
Metastatic Intraductal Carcinoma Breast	8	17.39
Metastatic Adenocarcinoma Prostate	6	13.05
Metastatic Papillary Carcinoma Thyroid	3	6.53
Metastatic Seminoma	3	6.53
Metastatic Follicular Carcinoma Thyroid	1	2.17
Metastatic Rhabdomyosarcoma	1	2.17
Metastatic Transitional Cell Carcinoma	1	2.17
Metastatic Adenocarcinoma	1	2.17
Inconclusive	1	2.17
Total	46	100.00

Table 12. Comparison of treatment modalities employed.

Treatment Modality	n	%
Surgery Alone	4	8.69
Surgery + Radiotherapy	27	58.69
Surgery + Chemotherapy	1	2.17
Surgery + Radiotherapy + Chemotherapy	10	21.74
Radiotherapy + Chemotherapy	2	4.35
Radiotherapy Alone	1	2.18
Chemotherapy Alone	1	2.18
Total	46	100.00

6. Discussion

The overall incidence of MSCC is increasing with increased survival of cancer patients. This condition has been the subject of discussion for many a year and only now some sort of consensus is being arrived at, as to the optimal management protocol for MSCC. This study was carried out in SKIMS, Srinagar over a period of 10 years and over this period, we detected 46 patients with Malignant and metastatic spinal tumours, which amounted to a hospital based incidence of 0.41% of all patients with spinal disease, who were admitted to our hospital during the study period. The overall incidence is expected to be much higher as a large proportion of terminally ill cancer patients are not properly screened for metastatic spinal cord compression.

Of the 46 patients diagnosed with metastatic spinal cord compression, no apparent change in incidence was detected over the decade. A preponderance of males over females was found among our patients; males numbering 63.49% whereas there were 36.51% females, which was in concordance with the results of Selcuk Yilmazlar, *et al.* [13], who had observed that 63.1% patients were males and 36.9% were females. These results were also in conformity with results derived by Loblaw, *et al.* [1] who reported 57% of their patients were men. Commonest age group of patients in this study was ≥60 years. Mean age of males was 48.4 years and that of females was 42.26 years, which corroborated well with the findings of Selcuk Yilmazlar, *et al.* [13], who in their study population noted a mean age of 48.9 ± 16.3 years. Median age of MSCC patients in this study was 49 years. The patients' median age at the time of the first episode of MSCC was 62 years from previous studies [1]. The earlier presentation in our patients can be attributed to earlier detection of MSCC in our patients due to screening by whole spine MRI. Median survival following a diagnosis of MSCC is reported as being around 2 to 3 months [1] [2] with 17% patients alive at one year and 10% patients at 18 months [2]. Survival data could not be calculated from our study, as our study had a retrospective component, which did not have a proper follow up.

A significant number of the patients in this study were from rural area 78.26% in number, whereas only 21.74% patients were from the urban areas. The larger number of patients hailing from rural areas can be safely attri-

buted to the fact that an overwhelming majority of our population is from rural areas. A large proportion of the patients were unemployed or engaged in household work. It is probable that the reason for this is difficult access to healthcare facilities and lack of knowledge about symptoms of MSCC. Comparable data for the same is not available from the previous studies.

The commonest symptoms reported were pain in neck/back in 43 (93.45%) patients and weakness of lower limbs in 42 (91.30%) patients. Back pain as the most frequent first symptom occurring in 95% of patients was reported by Levack, *et al.* [3]; in 96% of the patients in the study by Sarpel, *et al.* [14], whereas Loblaw, *et al.* [15] observed that 90% of patients have back pain. ME Hill, *et al.* [16] observed that the commonest symptom at the time of SCC was motor weakness (96%) followed by pain (94%). Dysaesthesia was seen in 30 (65.22%) patients in this study, which was in conformity to the findings of Held & Peahota [11], who noted that sensory symptoms were common. Urinary incontinence was reported by 21 (45.65%) patients and fecal incontinence by 11 (23.91%) patients. Autonomic disturbances are late sequelae of malignant and metastatic spinal cord compression. This was in concordance with the results of Loblaw, *et al.* [15], who reported bowel and/or bladder dysfunction in 50% of patients.

Commonest sign elicited was local spinal tenderness in 38 (82.61%) patients. A significant proportion of the patients, 37 (80.44%) in number, were paraparetic at time of presentation to the hospital. In our study only 9 (19.56%) patients were able to walk unaided at presentation, which is comparable to Levack and associates [2], who had reported that only 18% of patients were able to walk without help at the time of diagnosis of MSCC as reported by, which is in conformity to our findings. Loss of sensations below the level of the lesion was seen in 31 (67.39%) patients. This percentage was slightly higher than Levack and associates [2], who had noted that fifty two percent (52%) of patients had a clinical sensory level but this varied significantly in relation to the true level of compressive lesion. Cranial nerve examination was normal in all of the patients at time of presentation.

Upper limb power in most patients was Grade IV in 19 (41.3%) patients and Grade V in 17 (36.96%) patients. None of the patients had Grade I power in the upper limbs. Lower limb power was Grade III in 20 (43.48%) patients. 2 (4.35%), 11 (23.91%) and 12 (26.09%) patients had Grade I, Grade II and Grade IV lower limb power respectively. Only 1 (2.17%) patient had Grade V power in the lower limbs. This was statistically significant with a p-value of 0.001.

MRI was the most widely used imaging modality. MRI alone was used in diagnosis in 32 (69.56%) patients as compared to multi-slice CT scan which was used in 8 (17.39%) patients. Combined MRI & CT scan was required only in 6 (13.05%) patients for establishing the diagnosis. MRI was the investigation of choice for detecting metastatic spinal cord compression in our study. MRI has a high sensitivity for identifying metastatic disease within bone and can show the degree of spinal cord compression. MRI also allows the whole spine to be imaged, not just the level of suspected spinal cord compression. Sarpel, *et al.* [14] reported that the contrast resolution of MRI is superior to that of CT and the spinal axis can be imaged directly in multiple planes without image degradation. Whole spine MRI was done since Levack, *et al.* [3] observed that the site of pain did not correspond to the site of compression of the spinal cord. This ensures that spinal cord compression at other levels is not missed and identifies metastases affecting non-symptomatic vertebrae, which may lead to a change in clinical management. Cook, *et al.* [12] had previously observed that a sensory level was present in 47 of 85 patients, but in 26% the sensory level was four or more segments below or three or more segments above the actual lesion. Although modern multi-slice CT scanning is quick and has the ability to image the whole spine, it is less sensitive than MRI for detecting metastases and requires expert interpretation. Plain radiology is not as sensitive for detecting metastatic bone disease as MRI and does not readily show soft tissue abnormalities.

The commonest primary malignancy to metastasize to the spine in our study was Non-Hodgkin's lymphoma in 11 (23.91%) patients followed in turn by lung, breast and prostate malignancy in 10 (21.74%), 8 (17.39%) and 6 (13.04%) patients respectively. These findings corroborated well with the findings of Sundaresan and Galicich [17], who observed that the sites of primary cancer included the lung (25%), breast (14%) and connective tissue (12%). Levack, *et al.* [2] observed higher frequency of metastases from prostatic carcinoma than in our study. In their study Loblaw, *et al.* [1] reported that lung (23%), prostate (18%) and breast cancer (21%) accounted for 61.2% of the cases. They also reported similar incidence of metastases from lung and breast malignancies as our study, but slightly higher incidence of metastases from prostatic malignancies. In 3 (6.52%) patients, the site of the primary malignancy could not be ascertained in spite of exhaustive evaluation for the same, which correlated well with the report by Levack, *et al.* [2], who concluded that primary tumour was never identified, following investigation in 7% cases.

It was observed that certain malignancies had a propensity to involve one of the two sexes, which was statistically significant with a p-value of 0.001. Thyroid and breast malignancies were found exclusively in females in our study, whereas prostatic, testicular and urinary bladder malignancies as the source of primaries were seen in males only. The commonest primary malignancy to metastasize amongst males was lung malignancy in 9 (31.03%), patients amongst males. Amongst females, the commonest primary malignancy to metastasize was breast malignancy in 8 patients, which accounted for 47.06% of metastatic tumours amongst females. Livingston and Perrin [18] observed that, of all the women with MSCC, 30% had breast cancer. The higher percentage of metastases in female patients from breast malignancies in our study could be attributed to greater prevalence of breast malignancies in our patients and a probable increase in incidence of breast malignancies since 1978, when Livingston and Perrin published their study. Of the 3 metastatic occult primaries, 2 were males and 1 was a female patient.

Dorsal column region was the commonest region involved by metastatic lesions to the spinal column accounting for 29 (63.04%) patients. Our findings were consistent with Loblaw, *et al.* [1], Levack, *et al.* [3] and Cook, *et al.* [12] who observed that over two thirds of cases of MSCC occur in the thoracic spine. They also corroborated well with the findings of Brown, *et al.* [6] who noted approximately 70% of lesions are located in the thoracic spine. Loughrey, *et al.* [19] observed that the thoracic spine was the most frequently affected in 74% patients. Daniel Sciubba, *et al.* [20] had reported that all segments of the vertebral column are susceptible to distant metastasis, but the thoracic spine was by far the most frequent site (70%), which was quite consistent with our findings.

Metastases to cervical region occurred in 8 (17.39%) patients, dorso-lumbar region in 5 (10.87%) patients, cervico-dorsal region in 3 (6.52%) patients and lumbar region in 1 (2.17%) patient. Selcuk Yilmazlar, *et al.* [13] had noted that the metastasis was located in the cervical region in 7% patients, the thoracic region in 49.2% patients, the lumbar region in 28% patients, the thoracolumbar junction in 10.5% patients and the cervico-thoracic junction in 3.5%. Sundaresan and Galicich [17] report the sites of involvement included the cervical region in 13%, the thoracic region in 68% and the lumbar region in 20%. Me Hill, *et al.* [16] concluded that the thoracic spine was the commonest site of clinically dominant compression 71%, followed by the lumbosacral region 20% and cervical spine 9%. Though there was no appreciable difference between their studies and our study as regards to metastases to thoracic spine, however, our study reported a slightly higher propensity of involvement of cervical spine and a markedly less involvement of lumbar region. This can be attributed to different distribution of primary malignancies in our study and their respective studies.

Of the malignancies metastasing to cervical column, breast malignancies accounted for 4 (50.00%) patients, Non-Hodgkin's lymphoma accounted for 3 (37.50%) patients and lung malignancy accounted for 1 (12.50%) patient. Dorsal spinal column metastases were from lung malignancies in 8 (27.58%) patients, prostatic carcinoma in 5 (17.24) patients, Non-Hodgkin's lymphoma in 4 (13.79%) patients and thyroid malignancies in 4 (13.79%) patients. Other malignancies which metastasized to the dorsal spinal column were breast malignancies in 3 (10.35%) patients, testicular malignancies in 3 (10.35%) patients, transitional cell carcinoma of urinary bladder in 1 (3.45%) patient and an occult primary in 1 (3.45%) patient. The solitary lumbar metastasis was from a case of Non-Hodgkin's lymphoma. 2 patients of occult primaries metastasized to the cervico-dorsal region. Metastases to the dorso-lumbar region were 2 (40.00%) patients of Non-Hodgkin's lymphoma and 1 (20.00%) patient each of breast malignancy, prostatic carcinoma and lung malignancy. There was no comparative data from the previous studies for propensity of individual tumours to metastasize to specific regions of the vertebral column.

The commonest number of lesions involving the bony spinal column was two, which were seen in 14 (30.44%) patients. A solitary vertebral lesion occurred in 12 (26.08%) patients. This was followed by three lesions in 8 (17.39%) patients and four lesions in 4 (8.70%) patients. Multiple lesions involving several vertebral bodies were seen in 8 (17.39%) patients. Husband, *et al.* [10] reported that two or more levels of spinal cord or thecal compression were found in 35% patients with extradural spinal cord compression. Cook, *et al.* [12] observed that multiple levels of compression or impingement were found in 33 (39%) patients. Me Hill, *et al.* [16] observed there was radiological evidence of multiple levels of compression in 37%. Helweg-Larsen, *et al.* [21] demonstrated multiple metastases in 35% patients, but they conceded that this percentage might have been slightly higher if the cervical spinal canal would have been imaged in all cases. In our study, we noted a higher percentage of patients with involvement of two or more vertebral bodies than had been seen in previous studies. This can be due to wider application of whole spine MRI for imaging in our studies, which has a higher sensitiv-

ity of detecting lesions at multiple levels as compared to CT scan or myelography leading to detection of 2 or more levels of compression in nearly 74% patients.

Cord compression involved one region of spine in 82.53%, two regions of spine in 15.87% and three regions of spine in 1.59% patients. Husband, *et al.* [10] had similarly observed that in patients with MSCC, the spinal cord compression involved one region of the spine 80%, two regions in 18% and three regions in 2%.

The commonest histopathological variant seen among patients with MSCC was Non-Hodgkin's lymphoma in 11 (23.91%) patients. This was followed by metastatic squamous cell carcinoma, metastatic intra-ductal carcinoma breast and metastatic adenocarcinoma prostate in 10 (21.74%), 8 (17.39%) and 6 (13.05%) patients respectively. Metastatic papillary carcinoma thyroid and metastatic seminoma were seen in 3 (6.53%) patients each. Metastatic follicular carcinoma thyroid, metastatic rhabdomyosarcoma, metastatic transitional cell carcinoma and metastatic adenocarcinoma accounted for 1 (2.17%) patient each. Biopsy in 1 (2.17%) patient was inconclusive.

Treatment of patients with MSCC has been a raging controversy for the past 4 decades. Surgery was deemed as the ideal approach in 1960's. In 1970's and 1980's several studies came along which reported similar or better results with radiotherapy alone, than with surgery with or without radiotherapy. Only of late, consensus is developing as regards the ideal treatment modalities for MSCC. The optimal therapy for patients of MSCC has been debated for the past four decades and the debate is far from settled.

Early diagnosis and immediate treatment of spinal cord compression appears to offer the only hope of improving the outlook in patients of MSCC. This was emphasized in separate studies by Brice and McKissock [22]. Leviov, *et al.* [23] & Maranzanoand Latini [24]. Decompressive laminectomy with attempted removal of the tumour would appear to be advisable in all but a minority of cases and prompt decompressive laminectomy and resection of tumor seemed the only hope of restoring or preserving motor power and sphincter control. Studies published in the 1970s to 1980s showed that short-course radiotherapy gave a clinical outcome comparable with that resulting from more protracted regimens with only slight side effects in the study. Podd, *et al.* [25] also observed low fraction radiotherapy (2 - 5) regimens have a similar clinical outcome to more protracted regimens. Bansal, *et al.* [26] also reported similar results. Constans, *et al.* [27] observed that when preliminary surgery was performed as an emergency, it was designed to halt progression of the neurological syndrome and to prevent its more serious manifestations. Cobb, *et al.* [28] believed that in appropriate cases radiotherapy alone can yield results as good as laminectomy combined with radiotherapy. Surgical treatment in these studies most often was limited to laminectomy, which is now almost never done in isolation because of destabilizing and inadequate decompression, so these studies are of historical interest only.

A ground breaking study by Patchell, *et al.* [29] observed that significantly more patients in the surgery group (84%) than in the radiotherapy group (57%) were able to walk after treatment. They also observed that the patients treated with surgery also retained the ability to walk significantly longer than did those with radiotherapy alone (median 122 days versus 13 days, $p = 0.003$). They concluded that direct de compressive surgery plus postoperative radiotherapy is superior to treatment with radiotherapy alone for patients with spinal cord compression caused by metastatic cancer.

The commonest treatment modality employed was surgery, with or without radiotherapy and/or chemotherapy. 42 (91.3%) patients enrolled in the study were subjected to surgery, of which 4 (8.69%) patients were subjected to surgery alone. Surgery with post-op radiotherapy was given to 27 (58.69%) patients; whereas surgery + radiotherapy + chemotherapy were given to 10 (21.74%) patients. The standard procedure performed was a laminectomy followed by a procedure for stabilization of the spine. In this study, we used titanium cages along with screw and rod fixation to achieve spinal stability. Siegal, *et al.* [30] had previously also suggested encouraging outcome of anterior decompression of the spine, but all the patients in our study could be approached posteriorly with adequate tumour excision and cord decompression. In our study, 4 patients were deemed to be too frail to withstand a surgical procedure. In them, combination of chemotherapy and radiotherapy was given to 2 (4.35%) patients. Radiotherapy alone and chemotherapy alone were offered to 1 (2.18%) patient each.

Surgery may sometimes be performed with the prime intention to stabilize the painful spine. Patients with severe mechanical pain suggestive of spinal instability, or any neurological symptoms or signs suggestive of MSCC, should be nursed flat with neutral spine alignment until bony and neurological stability are ensured and cautious remobilization may begin. Rehabilitation by a physiotherapist remains an important component of management of the patients of MSCC after surgery has been performed, and ideally referral to a physiotherapist should be done within one month of the detection of the disease.

7. Conclusion

Although significant advances have been made on many fronts in the treatment of spinal metastases, one thing is quite clear; progress will continue to be made. It has been proved beyond any reasonable amount of doubt that surgical decompression with application of one of the several spinal stabilization techniques is the cornerstone of management of malignant and metastatic spinal cord compression. From improved surgical technique and spinal reconstruction, to focused radiotherapy and new local or systemic chemotherapy regimens, it is important to understand that the landscape is shifting, and we must continue to reassess our management paradigms for metastatic spinal cord compression.

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