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Original Research Article

Clinical Profile, Management, and Outcomes of Breast Carcinoma with Spinal Metastases: A Cross-Sectional Study

Dr. P. Rajendra Prasad[1], Dr. P. Varaprasad[2], Dr. A. Ramesh Kumar[3*], Dr. T. Suresh Kumar[4], V. Sureshkumar[5]

[1]Associate Prof Dept. of Surgery, Dr. B. R. Ambedkar Medical College, Bangalore
[2]Associate Prof Dept. of Orthopedics, SVS Medical College, Mahabubnagar, Telangana
[3]Prof Dept. of Surgery, Gouri Devi Medical College, Durgapur Medical College
[4]Prof Dept. of Surgery, Malla Reddy Medical College, Hyderabad
[5]Prof Dept. of Orthopedics, Dr. B. R. Ambedkar Medical College, Bangalore

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Abstract: ***Background:*** Breast carcinoma is the most common malignancy among women worldwide, and skeletal metastases represent a major cause of morbidity in advanced disease. The spine is the most frequent site of bone metastasis, often resulting in pain, neurological deficits, and mechanical instability. Optimal management requires a multidisciplinary approach integrating systemic therapy, radiotherapy, and surgical intervention tailored to disease burden and patient functional status. ***Objectives:*** To evaluate the clinical profile, management strategies, and outcomes of breast carcinoma patients presenting with spinal metastases. ***Methods:*** A cross-sectional study was conducted from July 2021 to December 2021 including 450 patients with histologically confirmed breast carcinoma and radiologically proven spinal metastases. Clinical features, radiological findings, management modalities including systemic therapy, radiotherapy, and surgery and outcomes were analyzed. ***Results:*** Multimodal management was employed in the majority of patients. Combined systemic therapy and radiotherapy constituted the most common treatment approach, while surgical intervention was reserved for patients with spinal instability or neurological compromise. Significant improvement in pain and neurological function was observed in patients receiving individualized, multidisciplinary management. ***Conclusion:*** Early diagnosis and evidence-based multimodal management significantly improve functional outcomes and quality of life in breast carcinoma patients with spinal metastases.

Keywords: Breast carcinoma, spinal metastases, management, radiotherapy, surgery.

INTRODUCTION

Breast carcinoma is the most frequently diagnosed cancer among women and remains a leading cause of cancer-related mortality worldwide [1]. Advances in early detection and systemic therapies have substantially improved survival rates. However, prolonged survival has led to an increased incidence of distant metastases, particularly to the skeletal system [2]. Bone metastases occur in up to 70% of patients with advanced breast cancer, with the spine being the most commonly affected site [3].

Spinal metastases develop predominantly through hematogenous dissemination and frequently involve the thoracic vertebrae, followed by the lumbar and cervical regions [4]. These lesions can result in progressive pain, pathological fractures, spinal instability, and metastatic spinal cord compression, which constitutes an oncological emergency [5]. Such complications significantly impair mobility, independence, and overall quality of life.

The management of spinal metastases in breast carcinoma is complex and must be individualized based on neurological status, extent of disease, tumor biology, and patient performance status. Current treatment strategies emphasize a multidisciplinary approach involving medical oncology, radiation oncology, spine surgery, and palliative care specialists [6]. Systemic therapy including chemotherapy, endocrine therapy, targeted agents, and bone-modifying drugs forms the cornerstone of disease control, while radiotherapy plays a critical role in pain relief and local tumor control [7].

Surgical intervention is primarily indicated in selected patients with spinal instability, progressive neurological deficits, or radioresistant tumors [8]. Advances in minimally invasive spinal surgery and stereotactic body radiotherapy have further refined treatment paradigms, allowing improved symptom control with reduced morbidity [9]. Despite these advances, variability in clinical presentation and access to multidisciplinary care continues to influence outcomes, particularly in resource-limited settings [10].

***Corresponding Author:** Dr. A. Ramesh Kumar
Prof Dept. of Surgery, Gouri Devi Medical College, Durgapur Medical College

This study aims to analyze the clinical profile, management strategies, and outcomes of breast carcinoma patients with spinal metastases in a real-world tertiary care context.

OBJECTIVE

The primary objective of this study was to assess the clinical characteristics of patients with breast carcinoma presenting with spinal metastases, including demographic distribution, presenting symptoms, anatomical location of spinal involvement, and neurological status at presentation.

The secondary objectives were to evaluate the various management modalities employed systemic therapy, radiotherapy, surgical intervention, or combined approaches and to analyze treatment outcomes in terms of pain relief, neurological improvement, functional status, and short-term survival. Additionally, the study sought to identify factors influencing outcomes to guide evidence-based clinical decision-making.

MATERIALS & METHODOLOGY

This cross-sectional observational study was conducted at a tertiary care teaching hospital over an 18-month period from July 2021 to December 2021. A total of 450 patients with breast carcinoma and spinal metastases were included. Ethical approval was obtained from the institutional ethics committee, and informed consent was secured from all participants.

Inclusion Criteria

- Female patients aged ≥18 years
- Histologically confirmed breast carcinoma
- Radiological evidence of spinal metastases on MRI or CT
- Patients receiving treatment or follow-up during the study period

Exclusion Criteria

- Primary spinal tumors
- Metastases from non-breast malignancies
- Patients with incomplete medical records
- Patients unwilling to provide consent

Data Collection Procedure

Data were collected using a structured proforma. Clinical parameters included age, menopausal status, duration of breast cancer, presenting symptoms, neurological status assessed using Frankel grading, and performance status. Radiological data included spinal level involvement and presence of spinal instability. Treatment details such as chemotherapy, hormonal therapy, radiotherapy, bisphosphonate use, and surgical intervention were documented. Follow-up data focused on pain relief, neurological outcomes, and complications.

Statistical Data Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 22. Descriptive statistics were used for demographic and clinical variables. Categorical variables were expressed as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. Associations between treatment modalities and outcomes were analyzed using chi-square tests, with a p-value <0.05 considered statistically significant.

RESULTS

Among the 450 patients studied, the mean age was 52.4 ± 9.6 years. The majority (58.7%) were between 41–60 years of age. Back pain was the most common presenting complaint (82.4%), followed by neurological deficits (46.2%). Thoracic spine involvement was noted in 55.1% of cases, lumbar in 30.4%, and cervical in 14.5%.

Table 1: Age Distribution of Patients

Age Group (years)	Number (n=450)	Percentage
<40	72	16.0%
41–60	264	58.7%
>60	114	25.3%

Table 2: Clinical Presentation

Symptom	Frequency	Percentage
Back pain	371	82.4%
Motor weakness	208	46.2%
Sensory loss	164	36.4%
Bowel/bladder dysfunction	92	20.4%

Table 3: Spinal Level Involvement

Region	Frequency	Percentage
Cervical	65	14.5%
Thoracic	248	55.1%
Lumbar	137	30.4%

Table 4: Treatment Modalities

Treatment	Number	Percentage
Systemic therapy + Radiotherapy	248	55.1%
Surgery + Adjuvant therapy	124	27.6%
Radiotherapy alone	78	17.3%

Table 5: Treatment Outcomes

Outcome	Improved	Stable	Worsened
Pain	72.4%	21.3%	6.3%
Neurology	58.2%	32.4%	9.4%

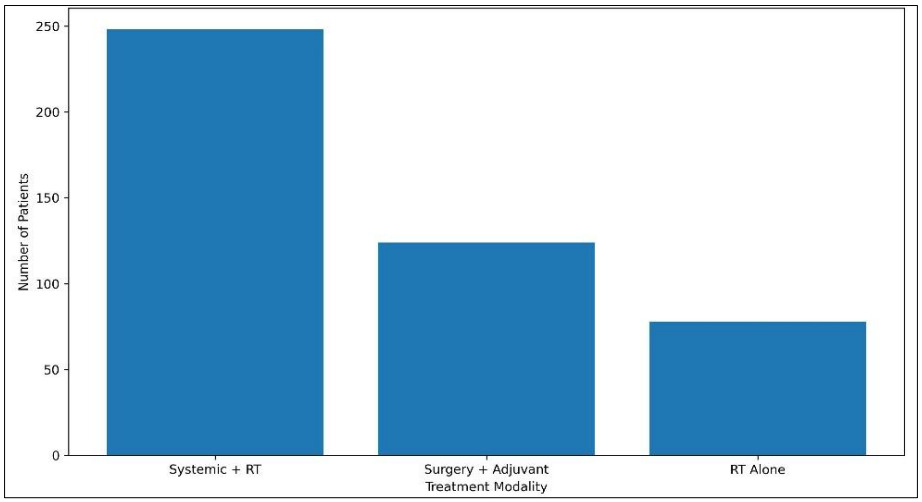

Figure 1: Distribution of Treatment Modalities

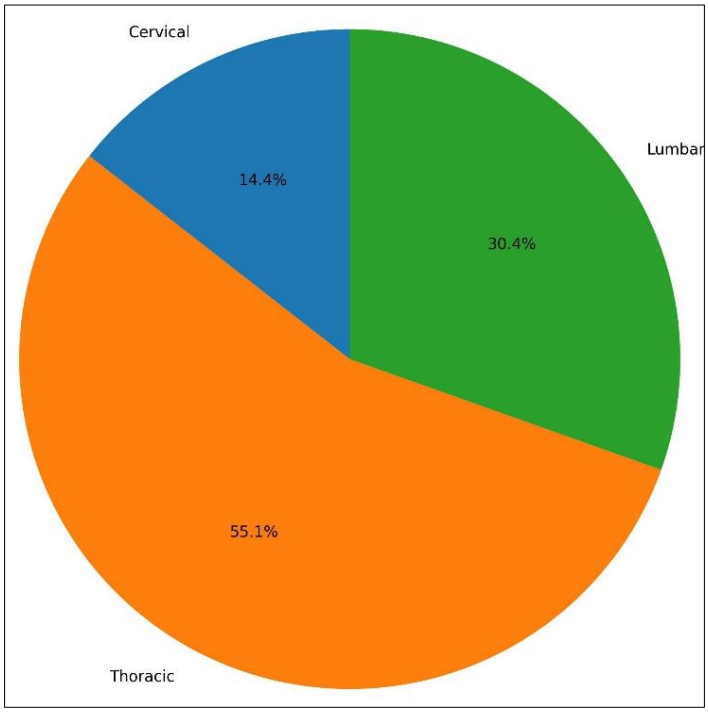

Figure 2: Anatomical Distribution of Spinal Metastases

DISCUSSION

The present study highlights the substantial burden of spinal metastases among patients with advanced breast carcinoma and underscores the importance of early diagnosis and appropriate management. The predominance of thoracic spine involvement and high incidence of pain observed in this cohort are consistent with previously published studies [11,12]. Delayed presentation with neurological deficits remains a significant challenge and adversely affects outcomes.

Management strategies in this study largely reflected contemporary clinical practice, with most patients receiving multimodal treatment. Systemic therapy combined with radiotherapy was the most frequently employed approach and resulted in significant pain relief and neurological stabilization. Radiotherapy remains the standard of care for painful spinal metastases and metastatic spinal cord compression, particularly in patients without mechanical instability [13,14]. The observed improvement in symptoms aligns with established evidence supporting radiotherapy as an effective palliative modality.

Surgical management was selectively utilized for patients with spinal instability or progressive neurological deterioration. Several studies have demonstrated that decompressive surgery followed by radiotherapy provides superior neurological outcomes and ambulatory preservation compared to radiotherapy alone in appropriately selected patients [15,16]. The favorable outcomes observed in surgically managed patients in this study further reinforce the role of surgery within a multidisciplinary framework.

Overall, the findings emphasize that management decisions should be guided by validated scoring systems, such as the Spinal Instability Neoplastic Score and prognostic models, to optimize patient selection and outcomes [17]. Continued integration of novel systemic therapies and advances in radiation and surgical techniques is expected to further improve survival and quality of life in patients with breast carcinoma and spinal metastases [18–20].

LIMITATIONS OF THE STUDY

Despite its large sample size, this study has several limitations. The cross-sectional design limits the ability to assess long-term survival and disease progression. Being a single-center study, the findings may not be generalizable to all populations. Additionally, quality-of-life assessments were not quantitatively measured, and molecular subtyping of breast cancer was not uniformly available for all patients. Future prospective, multicenter studies with longer follow-up are warranted to validate these findings.

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CONCLUSION

Spinal metastases represent a significant and debilitating complication of breast carcinoma, with substantial impact on patient morbidity and quality of life. This study demonstrates that middle-aged women with advanced breast cancer commonly present with thoracic spinal involvement and severe pain, often accompanied by neurological deficits.

Early recognition, prompt imaging, and a multidisciplinary treatment approach are essential for optimal outcomes. Combined systemic therapy, radiotherapy, and surgical intervention when appropriately indicated can significantly improve pain control, neurological function, and overall patient well-being. Strengthening referral pathways and increasing awareness among clinicians may further enhance early diagnosis and management.

Conflict of Interest and Funding Disclosure

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