ORIGINAL ARTICLE

Radiation Therapy in Skeletal Metastases

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Summary

From June 1993 to September 1995, 132 case files of patients who received palliative radiotherapy (RT) for skeletal metastases were reviewed. Majority of the patients (75/132) was in the age range of 41 - 60 years. Common sites of metastases were the vertebrae (86 patients) and the pelvic bones (40 patients). The major primary tumors encountered were as follows : multiple myelome (30), breast cancer (25) and prostate cancer (20). Pain was the commonest symptom of presentation. Doses of palliative RT ranged from 8 - 40 Gy in different fractionation schedules. Ninety-four patients showed more than 50% symptomatic response, 26 had no response and 12 were lost to follow up immediately after the treatment. Single fraction treatments resulted in almost similar responses compared to various multiple fraction treatments. To conclude, short course radiation therapy regimes are optimum in our local circumstances where RT resources are limited and patients have to travel long distances to attend hospital.

Key Words: Skeletal metastases, Radiation therapy; Palliation

Introduction

Bone is a common site of metastatic disease. The common primary tumors metastasising to the bone are neoplasms of breast, prostate, lung, thyroid and kidney[1]. The pattern of distribution of skeletal metastasis in similar for most tumors affecting the spine, pelvis, ribs, skull, proximal femora and typically more than one site is involved[2]. The prognosis depends upon the primary tumor and involvement of the other organs.

The skeletal metastasis as such is not the usual cause of death in these patients but it produces considerable morbidity. About 70 - 80% of skeletal metastases are painful and radiation therapy plays a vital role in alleviating this. To study the efficacy of radiotherapy, we present an analysis of 132 patients with skeletal metastases who received palliative RT.

Materials and Methods

This study is a retrospective analysis of 132 patients with skeletal metastases who received palliative RT in our hospital during the period between June 1993 to September 1995.

Pretreatment Evaluation

Pretreatment evaluation consisted of complete history and clinical examination, routine haematological and relevant radiological investigations depending upon the primary tumor. All patients had the histopathological verification of the primary tumor or the metastatic lesion where the primary if not known. The diagnosis of bone metastasis in cases where the primary is known was established on radiological basis. This included plain X-ray of the suspected site of bony metastases in all patients. Other investigations like CT Scan, MRI Scan or bone scan were done wherever needed (17 patients).

Treatment

The indications of palliative RT to the involved metastatic sites were severe pain, impending or established bone fracture and spinal cord compression. RT treatment planning was done on an X-ray simulator. All patients were treated with Cobalt-60 teletherapy

unit (Theratron 780). The dose of RT was prescribed depending upon the general condition, expected survival and ambulatory status of the patient. A short course treatment regime like 8 Gy in 1 fraction was preferred in-patients who were nonambulatory, had poor general condition and short life expectancy.

Assessment of Response

The aim of treatment was to provide symptomatic relief. This response to radiotherapy treatment was determined on a subjective basis using the following criteria:

Complete Response (CR) : complete disappearance of all the symptoms.

Partial Response (PR) : more than 50% symptomatic relief.

No Response (NR) : no relief or progression of symptoms.

Follow Up

All patients were followed up monthly. Some of the patients, who had widespread disease with poor prognosis, were exempted from a strict and rigid follow up.

Results

Of the 132 patients treated, there were 73 males and 59 females. The age ranged from 14 to 80 years with a median age of 52 years (Fig. 1). Table I shows the pattern of the distribution of bone metastases. The commonest sites of metastases were spine, pelvis and rib cage. Amongst the vertebral metastasis, the lumbar region was the commonest.

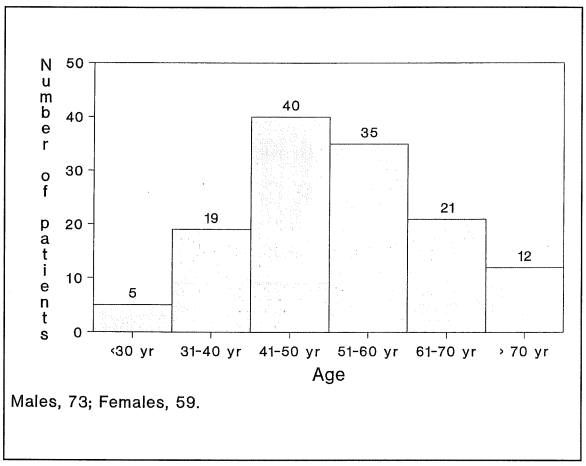

Fig. 1 Age distribution of patients.

Table I
Distribution of bone metastases

	Site		No.	%
1.	Spine	:	86	65
	- cervical	:	7	5
	- thoracic	:	46	35
	- lumbar	:	53	40
	- sacral	:	6	5
2.	Pelvis	:	40	30
3.	Rib Cage	:	18	14
4.	Long Bones	:	17	13
5.	Skull	:	6	5

Some pts had more than one metastatic site.

Table II
Distribution of patients according to primary site

Tumor Type		No.	%
1. Multiple Myeloma	:	30	23
2. Breast	:	25	19
3. Prostate	:	20	15
4. Unknown Primary	:	16	12
5. Lung	:	13	10
6. Thyroid	:	7	5
7. Lymphoma / Leukemia	:	4	3
8. Kidney	:	3	2
9. Others	:	14	11
Total	:	132	100

Table III
Response with different dose fraction schedules

Dose of Radiation	No. of Pts	CR + PR	NR	Lt. FU
8 Gy / 1F	66	45	14	7
10 Gy / 2F / 2d	7	5	2	0
15 Gy / 3F / 3d	30	21	6	3
20 Gy / 5F / 1wk	17	14	3	0
30 Gy / 10F / 2wks	7	5	0	2
32 - 40 Gy / 16 - 20 F	5	4	1	0
Total	132	94 (71)	26 (20)	z12 (9)

CR; Complete Response
PR; Partial Response
NR; No Response
Lt. FU; Lost to follow-up

Numbers in parenthesis represent percentage.

Table IV
Median survival by primary tumor

Primary Tumor	Median Survival (months)
Prostate Cancer	18
M. Myeloma	12
Breast Cancer	10
Lung Cancer	5
Median overall survival = 8 months	

As evident from Table II, the common primary tumors were multiple myeloma, breast cancer, prostate cancer and lung cancer. Radiologically, 99 patients had osteolytic lesions, 19 osteosclerotic and 14 had mixed lesions. Forty-two cases had solitary while remainder 80 had multiple bone metastases.

Doses of RT ranged from 8 Gy to 40 Gy. The various dose fraction schedules are listed in Table III. Most of the patients (68%) received the RT regime of 8 Gy in single fraction. Five patients (thyroid 3, lymphoma 2) received 40 Gy in 20 fractions over 4 weeks. Twelve patients were lost to follow up soon after the treatment. One hundred and twenty cases were available for evaluation of response. As evident from Table III, more than 50% response was observed in 94 patients (71%). Twenty-six (20%) showed no response (NR) or progression of the symptoms. The follow up period ranged from 2 months to 40 months (median 8 months). The overall survival at one year was 20%. Patients who had primary tumor in the prostate had longer median survival than those in lung (Table IV).

Discussion

Longer survival of cancer patients increases the incidence of skeletal metastases. The prevalence of bone metastasis is estimated to be about double the number of new cases[3]. These patients comprise the largest group of patients receiving palliative RT[4].

In our study, the pattern of metastases and the primary site is similar with established work in the literature[1,2,4].

The treatment of skeletal metastasis, in general, is poorly defined. Published guidelines regarding radiation therapy are not uniform. This is perhaps due to great variation in the results of clinical trials and reports of treatment of large variety of patients using different scoring methods and reporting technique. Yet the treatment with radiotherapy remains very effective and continues to be the preferred method of treatment as it is easy to deliver, economical, least toxic and requires no hospitalisation. It helps significantly in relieving pain, spinal cord compression and impending fracture. The exact mechanism of pain relief after radiotherapy is not well understood. Early pain relief with hemi body irradiation is so rapid as to be related to tumor cell kill. Pain relief that occurs later and is durable is probably related to tumor cell kill. A combination of processes is involved, some of which are not yet identified[5].

Traditionally local field radiotherapy has been used for patients with symptoms from one or several lesions as with spinal cord compression or impending fracture of a long bone. Local field radiotherapy yields pain relief in 80 - 90%[6]. Half body radiotherapy is indicated in some patients with short life expectancy who have multiple symptomatic metastases[7]. Systemic radiotherapy comprises wide field irradiation and radionuclide therapy.

There are no standard dose fractionation schedules of radiation therapy for treatment of bone metastasis. Various doses ranging from 8 - 30 Gy have been used in different dose fractionation regimes (single fraction to 15 fractions). However the dose fraction schedules differ from centre to centre and from country to country. Some authors[7,8] favour the short course treatments while others[9,10] prefer the prolonged treatments. In a developing country like India, where the radiotherapy resources are limited, the dose fraction schedules should be optimised accordingly. We prefer short course treatments in the majority of patients (Table III) for two main reasons. Firstly, majority of patients come from distant areas and feel inconvenient while travelling long distances. Secondly, the short course treatments avoid the overloading of hospital staff and resources. The results with various dose fraction schedules in our study are similar (Table III) and hence our policy of preferring short course treatments is justified.

Ninety-four patients had more than 50% symptomatic response. Thus response rates in our study are comparable to those in the literature. Hoskin[8] in his study reported no difference in the pain relief between a single dose and multiple dose fraction schedules. The results of our study are almost similar to his study. On the other hand Blitzer[9] and Zelefsky[10] concluded in their respective studies that pain relief was better with multiple fractions as compared to a single fraction.

There is no strong evidence in the literature that radiotherapy prolongs the survival in such patients, although this is a possibility. Price et al[11] reported the median survival of 11 months in responders compared to 5 months in nonresponders.

There is a wide range of median survival among patients with skeletal metastases from different primary tumor types : prostate, 29.3 months; breast, 22.6 months; renal, 8.6 months; lung, 3.6 months[12]. We have observed the median survival time of 18 months, 12 months, 10 months and 5 months in the skeletal metastases from prostate cancer, multiple myeloma, breast cancer and lung cancer respectively (Table IV). These survival figures are slightly inferior in comparison to the world literature. This could be due to the fact that Indian patients present at a far advanced stage of the disease and have higher frequency of associated visceral metastasis by the time they report to the hospital for the treatment.

To conclude, radiotherapy is an effective modality for palliation of skeletal metastases in a significant number of patients. Since the results with different dose fractionation schedules of radiotherapy are almost similar, it is suggested that short course treatments, mainly single fraction treatments, should be promoted in a developing country like India, where radiotherapy resources are limited and the majority of patients have poor socio-economic status and have to travel long distances for treatment. However, prospective randomised trials are needed to establish the optimum dose fraction schedules of radiotherapy for the treatment of skeletal metastasis.

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