Brief Report

Half-Body Irradiation With Tomotherapy for Pain Palliation in Metastatic Breast Cancer

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Abstract

Context. Half-body irradiation (HBI) is the fastest and most effective tool against uncontrolled pain from widespread bone metastases but is somewhat toxic.

Objectives. To assess the feasibility of lower HBI with helical tomotherapy in patients with metastatic breast cancer in terms of acute toxicity and delay in chemotherapy administration.

Methods. Thirteen breast cancer patients with multiple painful bone metastases to the lower half of the body were enrolled in this prospective trial. Eight patients were receiving chemotherapy. Target volume included all bones from the L3–L4 interface to the femoral shafts. Radiation consisted of 8 Gy in one fraction, delivered with helical tomotherapy. Patients were premedicated only with oral steroids. Pain intensity was scored using the Numeric Rating Scale from 0 to 10. Toxicity was scored using the Common Terminology Criteria for Adverse Events, version 3.0. Quality of life was scored with the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30, before and 21 days after the radiation course. This trial was approved by the local review board.

Results. Median follow-up was at seven months (range 2–12 months). All but two patients had pain relief in the radiated field. Six patients stopped their analgesic drug consumption. Toxicity was acceptable: two Grade 3 hematologic toxicities were registered (anemia and leukopenia). Grade 1–2 toxicities were hematologic = 13, fever = 3, nausea = 2, and diarrhea = 1. Three of the eight patients had a delay in chemotherapy administration because of leukopenia or anemia. Twelve patients answered to European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30, and an improved quality of life was documented in eight cases.

Conclusion. Lower HBI delivered with helical tomotherapy resulted in a well-tolerated regimen, without significant delay in chemotherapy schedule. J Pain Symptom Manage 2014;47:174–180.

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Accepted for publication: March 19, 2013.

0885-3924/$ - see front matter
http://dx.doi.org/10.1016/j.jpainsymman.2013.02.022

Key Words
Tomotherapy, half-body irradiation, single-dose, multiple bone metastases, pelvis

Introduction

Half-body irradiation (HBI) provides rapid and effective palliation of bone pain from widespread metastatic cancer. First introduced in the 1970s as a way to treat several symptomatic areas within a single radiation field,[1,2] HBI was given to the most symptomatic half of the body (upper, mid, or lower), using high single doses with an opposed field technique. The high single-dose HBI (SD-HBI) technique achieved a rapid subjective and objective response, but the treatment was somewhat toxic.[2,3] The toxicities associated with SD-HBI included acute radiation syndrome,[4] subacute hematologic toxicity, and chronic pulmonary toxicity, requiring a comprehensive premedication program with antiemetics and fluids.[5,6]

Fractionated HBI allowed for an increase in the total dose with reduction in acute toxicity, and it eliminated the need for premedication or a long period of observation that may include hospitalization. The 15 Gy/five fractions/five days and the 12 Gy/four fractions/two days schedules are now considered the most convenient, with equivalent efficacy.[7,8]

Despite these findings, an SD-HBI schedule still remains a commonly used fractionation scheme to deliver HBI.[9–12] This one-day schedule still has the disadvantage of requiring pre- and post-HBI medication, and in some cases, hospitalization. Patients who receive lower body SD-HBI also report diarrhea two weeks after completion of the treatment in 50% to 73% of cases.[11,13,14]

We hypothesized that the adoption of a novel high-tech treatment technique such as helical tomotherapy could reduce intestinal toxicity and make lower body SD-HBI safe and feasible without the need for premedication or a long period of observation. This study focuses on patients with metastatic breast cancer, who have been reported as the subset of patients who have the best prognosis in terms of survival after HBI.[6,8]

Methods

Study Population

The study was a single-arm, prospective, Phase I clinical trial focused on patients with metastatic breast cancer with uncontrolled pain in multiple areas of the lower half of the body. Bone metastases had to be confirmed by radiological imaging (X-rays and bone scan). Inclusion criteria were histologically confirmed breast cancer, Eastern Cooperative Oncology Group performance status ≤3, hemoglobin ≥10 g/dL, white blood cell count ≥3000/μL, neutrophils ≥1000/μL, platelets ≥100,000/μL, and adequate renal function. The trial was open to patients with ongoing chemotherapy, with at least two weeks from previous chemotherapy administration at the time of the SD-HBI. Previous localized radiotherapy in the target area also was allowed. All eligible patients gave written informed consent for this trial and were required to get a new blood count before HBI administration.

From June 2011 to July 2012, 13 women with breast cancer were entered into this prospective trial. The median follow-up was seven months (range 2–12 months). At the time of the analysis, 11 patients (85%) were alive. Baseline patient and tumor characteristics are shown in Table 1. All patients had uncontrolled severe pain from multiple bone metastases to the lower half of the body. All women used analgesics at

Table 1
Patient Characteristics at Baseline

Characteristic	*n*
Mean age (years) at time of HBI (range)	56.4 (40–68)
Tumor subtypes	
Luminal A	4
Luminal B	6
HER2+	2
Triple negative	1
Extra bone metastatic disease	
Yes	7
No	6
Skeletal complications during the three months before HBI	
Yes	2 (fracture)
No	11
Systemic therapy at time of HBI	
Hormonal therapy	5
Chemotherapy	8
ECOG performance status	
1	7
2	4
3	2

HBI = half-body irradiation; HER2+ = human epidermal growth factor receptor 2; ECOG = Eastern Cooperative Oncology Group.