Surgical Oncology (2007) **16**, 311–330

Available at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/suronc

REVIEW

Palliative care in orthopaedic surgical oncology

Pamela M. Aubert, Richard J. O'Donnell*

UCSF Comprehensive Cancer Center, Orthopaedic Oncology Service, 1600 Divisadero Street, San Francisco, CA 94115-1939, USA

KEYWORDS
Pathologic fractures;
Skeletal metastases

Summary
Hundreds of thousands of Americans are affected every year by skeletal complications of oncologic disease. Recent developments in medical oncology, radiation oncology and radiology, particularly with respect to the use of bisphosphonate medication and radiofrequency techniques, have served to greatly lessen the morbidity associated with metastatic skeletal disease. Similarly, there has been significant advancement in the field of orthopaedic oncology in the areas of internal fixation, endoprosthetic implant design, and minimally invasive kyphoplasty technology. Given the palliative intent of intervention in this patient population, the goal of treatment of skeletal metastases must be optimization of limb function and ultimately, quality of life.

Contents

*Corresponding author. Tel.: +1 415 885 3800; fax: +1 415 885 3802.
E-mail address: odonnelr@orthosurg.ucsf.edu (R.J. O'Donnell).

0960-7404/$ - see front matter © 2007 Elsevier Ltd. All rights reserved.
doi:10.1016/j.suronc.2007.08.005

Introduction

Ordinarily, the first responsibility of the oncologist is to diagnose and treat with *curative* intent. For patients with primary bone or soft tissue sarcomas, the musculoskeletal oncologist is often able to marshal advances in the fields of medical oncology, radiation oncology, and orthopaedic surgery so as to effect, or at least attempt to achieve, a cure. Treatment goals for sarcoma patients must be strictly prioritized, however, in order of (1) life; (2) limb; (3) limb function; (4) leg length equalization; and (5) cosmetic appearance [1].

Statistically, however, the vast majority of adult orthopaedic oncology patients present for care of skeletal complications secondary to metastatic disease. For these patients, the broad goal of intervention is *palliation*, with more specific reference to preservation of limb function. Any and all orthopaedic intervention, nonetheless, must be subordinated to quality of life concerns. Cognizant of recent advances in allied disciplines, the orthopaedic oncologist must work as a member of a team consisting of the patient, family members, caregivers, and medical colleagues, so as to provide optimal, coordinated care.

Perhaps the most striking recent advance in the care of patients with skeletal metastases has been the introduction of bisphosphonates, which have greatly improved quality of life by minimizing skeletal complications caused by bone resorption. Potent intravenous [2–15] and oral [16] forms have been developed to offer a convenient treatment regimen. Non-operative interventions in the area of radiation oncology, such as single fraction therapy [17,18] and hemibody irradiation (HBI) [19], have similarly allowed expedited care that is nonetheless more efficacious and less morbid than conventional techniques. Finally, the addition of systemic radioisotopes to local radiotherapy has shown success in the palliation of pain from osseous metastases and reduced the need for analgesic support [20–22].

Surgical advances over the past two decades have also greatly improved quality outcomes for patients with skeletal metastases [23–25]. The principal developments have been the availability of endoprostheses for replacement of massive osseous defects [26–29], the emphasis on the use of reconstruction rods for intramedullary fixation [24,30,31], and the emergence of locking technology for plate fixation [32,33]. Long recognized to be important as an augment to internal fixation, cement [34–36] is now being utilized for percutaneous vertebral body reinforcement [37,38]. Another minimally invasive technique, radiofrequency ablation (RFA) is receiving increased attention as an effective tool for the management of refractory metastatic deposits where surgery is not an option [39–43].

With all of these (complimentary and sometimes overlapping) pharmaceutical and technological advances available in the modern armamentarium, the question of *how* to ultimately treat any given bone metastasis has become less important than deciding *which lesions in which patients* need to be treated in the first place. That is to say, defining the indications for intervention has become more central to successful palliative care than ever. Nonetheless, predicting when to intervene remains a fairly complex decision-making process that must be individualized according to the clinical and radiographic presentation of each patient.

Predicting pathologic fracture risk

The only (relatively) absolute indications for orthopaedic surgical intervention in metastatic bone disease include: (1) overt fracture in the femur, tibia, or weight-bearing portions of the pelvis and (2) spinal fracture with epidural compromise. Even under these circumstances, intervention would be contraindicated by the existence of very limited prognosis and/or extensive co-morbidities. Thus, in most cases, intervention for metastatic bone disease is fairly *elective*. This is especially true when pathological fracture is thought to be *impending*. Predicting fracture risk has always been the source of considerable controversy, and remains subjective, essentially more of an art than a science.

Studies have shown that even experienced orthopaedic surgeons cannot accurately estimate the strength reduction or load-bearing capacity of long bones by using plain radiographs alone [44]. Classic guidelines for treating lower extremity bone metastases have historically relied on estimates of load-bearing capacity by assessing the geometry of the defect on plain radiographs. Frequently cited parameters of an impending fracture include a lesion that is