



Systematic review

A review of patterns of practice and clinical guidelines in the palliative radiation treatment of uncomplicated bone metastases



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ABSTRACT

Background and purpose: Single fraction radiation treatment (SFRT) is recommended for its equivalence to multiple-fraction (MF) RT in the palliation of uncomplicated bone metastases (BM). However, adoption of SFRT has been slow.

Materials and methods: Literature searches for studies published following 2014 were conducted using online repositories of gray literature, Ovid MEDLINE, Embase and Embase Classic, and the Cochrane Central Register of Controlled Trials databases.

Results: A total of 32 articles detailing patterns of practice and clinical practice guidelines were included for final synthesis. The majority of organizations have released high level recommendations for SFRT use in treatment of uncomplicated BM, based on evidence of non-inferiority to MFRT. There are key differences between guidelines, such as varying strengths of recommendation for SFRT use over MFRT; contraindication in vertebral sites for SFRT; and risk estimation of pathologic fractures after SFRT. Differences in guidelines may be influenced by committee composition and organization mandate. Differences in patterns of practice may be influenced by individual center policies, payment modalities and consideration of patient factors such as age, prognosis, and performance status.

Conclusion: Although there is some variation between groups, the majority of guidelines recommend use of SFRT and others consider it to be a reasonable alternative to MFRT.

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Despite general consensus on the use of single fractions (SF) in the palliative radiation treatment (RT) of symptomatic, uncomplicated bone metastases (BM), there has been slow adoption of the practice worldwide [1]. The current body of evidence supports equivalence of SFRT to multiple-fraction (MF) RT in providing pain-relief, with no differences reported in acute or long-term toxicities [1–2]. In addition to its convenience for patients and their caregivers, SFRT use is also a cost-effective solution [3–4].

Since the last assessment of clinical practices surrounding SFRT use by our group in 2014, several new guidelines have been released that reinforce the existing recommendations for use of SFRT in the treatment of BM [1]. Furthermore, several initiatives aimed at increasing SFRT utilization, implemented by single institutions and national associations alike, have since been planned, implemented, and their effects studied.

The purpose of this present review was to summarize the current landscape of SFRT-related guidelines and recommendations; and to assess whether there has been a change in the patterns of practice in response to recent developments.

Methods

A literature search for patterns of practice was conducted using Ovid MEDLINE (1946 – Week 2 2016), Embase and Embase Classic (1947 – Week 38 2016), and the Cochrane Central Register of Controlled Trials (August 2016) databases. A separate search for guidelines was performed using Ovid MEDLINE (1946 – Week 2 2016), and Embase and Embase Classic databases (1947 – Week 38, 2016). Both searches were limited to English and the first search was restricted to articles published after 2014. Subject headings and keywords used included ‘bone metastasis’, ‘radiation therapy’, ‘radiotherapy’, ‘irradiation’, ‘palliative’ ‘palliation’, ‘dose fractionation’, and ‘patterns of practice’. Searches for guidelines in gray literature were also conducted using several online repositories including: CPG Infobase, Canadian Best Practices Portal, National

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Guideline Clearinghouse, Trip Database, National Institute for Health and Care Excellence, Australian Government National Health and Medical Research Council and New Zealand Ministry of Health. Titles and abstracts were screened independently by two authors (SC, VG) to determine relevant articles to be obtained for full-text review.

Articles eligible for inclusion were: (i) primary research studies that disclosed patterns of SFRT utilization; or (ii) policies and formal guidelines produced by expert panels or committees reviewing published evidence and/or clinical evidence. Physician surveys using hypothetical scenarios, and studies wherein dose fractionation was investigated using patient preferences were not included. Conference statements were excluded. Abstracts were included. Full text articles were screened by VG and SC. If disagreement existed, discussion ensued until a consensus was reached.

In eligible articles that disclosed patterns of practice, extracted information included the proportions of SFRT use and other fractionation schedules used; and if available, temporal trends in SFRT prevalence and types of BM irradiated. Fig. 1 depicts the inclusion process of the articles.

Results

There were 11 studies regarding patterns of practice, and 21 articles detailing clinical practice guidelines or recommendations identified for final synthesis. Of the included articles, 7 were Canadian, 14 were American, 8 were European, 1 was Asian and 2 were Oceanic. Patterns of practice are summarized in Table 1.

Canada

Clinical guidelines

Under Choosing Wisely Canada, a task force with representation from the Canadian Association of Radiation Oncology, the Canadian Association of Medical Oncologists and the Canadian Society of Surgical Oncology convened to produce 10 recommendations to avoid low-value and harmful practices in cancer care [5]. Use of SFRT for palliative radiation of uncomplicated painful BM was one of the final recommendations delivered by the task force.

Provincial guidelines also provide direction in the use of SFRT in this patient population. In 2004, the Supportive Care Guidelines Group of Cancer Care Ontario formulated a practice guideline which received a 75% approval rate of reviewing practitioners in the province [6]. Given radiologically confirmed BM or any pain corresponding to non-irradiated areas, and the absence of pathological fractures and spinal cord compression (SCC), the group concluded SFRT (8 Gy) should be used in the treatment of symptomatic and uncomplicated disease.

A clinical practice guideline provided by the Alberta Health Services, effective 2016, also recommended use of SFRT for uncomplicated BM. The organization also remarked that from a health systems' perspective, SFRT is more convenient for patients and cost-effective compared to stereotactic body radiotherapy or MFRT. SFRT (8 Gy) was also recommended for patients with neuro-pathic pain [7].

Patterns of practice

Data from provincial cancer registries indicated that across 5 provinces, 50.2% of patients receiving palliative RT for BM were prescribed SFRT in 2013. That year, British Columbia (B.C.) used the most SFRT (60%) and Saskatchewan used the least (31%) [8].

The impact of landmark studies, guidelines and interventions regarding SFRT use have been studied in Ontario and B.C. Ashworth et al. investigated the prevalence of SFRT in Ontario following the publication of the Cancer Care Ontario (CCO) guideline in 2004 [9]. From 1984 to 2012, 161 835 courses of irradiation were prescribed, of which SFRT accounted for 43.9%. In the mid-1980s, SFRT accounted for 30–35% of courses of treatment. The authors noted a sharp increase in 1987 to over 50% SFRT use in 1989. This was followed by a gradual decrease to just below 40% in the mid-1990s. Second and third increases were observed in the late 1990s and following 2004 respectively. Rates of SFRT increased from 42.3% in 1999–2003 to 58.7% in 2004–2007; and subsequently decreased to 44% in 2008–2012. These increases corresponded with new publications, including the Ontario provincial practice guideline's endorsement of SFRT in 2004.

In B.C., Olson et al. reported rates of SFRT use in 2007 (50.5%), 2008 (50.9%), 2009 (48.3%), 2010 (48.5%), 2011 (48.0%) and remarked on the significant increase observed in 2013 (59.7%, $p < 0.001$) [10]. The authors attributed this increase post-2012 to the implementation of an intervention; wherein, emails with center average information were sent to radiation oncologists, a meeting was organized with professional practice leaders to discuss regional differences, and an in-person meeting was conducted with practicing radiation oncologists at a regional conference. Analyzing only RT courses delivered in 2013 from the same dataset, Tiwana et al. reported higher SFRT use in uncomplicated (70.4%) compared to complicated (39.4%) BM [11].

United States

Clinical guidelines

Guidelines in the RT of symptomatic BM have been put forth by several national organizations in the US, with a few key differences among them regarding the recommendation of SFRT use.

In their 2017 update to the 2011 evidence-based guidelines, ASTRO confirmed long-term safety and equivalence to MFRT in pain relief [12]. Increased risk of pathologic fracture with SFRT was deemed equivocal. SFRT use was recommended strongly for patients with limited life expectancy. Whereas ASTRO was unable to comment on the efficacy and safety of treatment in spinal versus peripheral metastases previously, the group was able to confirm successful and safe palliation with retreatment in both sites with evidence from a randomized trial.

The American College of Radiology (ACR) Appropriateness Criteria provide guidelines produced by a multidisciplinary expert panel, based on analysis of peer-reviewed literature and clinical experience [13]. Therapeutic guidelines published in 2009 by the ACR expert panel remarked upon cost effectiveness, and equivalence to MFRT in pain relief and overall survival in patients with poor prognoses. For patients with good prognoses, the panel offered the advantage of optional retreatment with SFRT as a way of periodically reducing tumor burden and providing symptom control in noncritical anatomic sites.

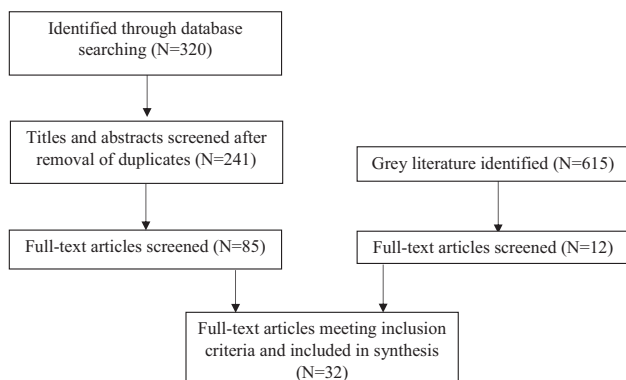


Fig. 1. Flowchart of article inclusion process.

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