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## Review Article

## Quality of life after palliative radiotherapy in bone metastases: A literature review



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## ABSTRACT

**Objective:** To investigate the quality of life (QOL) following palliative radiotherapy for painful bone metastases.**Methods:** A literature search was conducted in OvidSP Medline (1946–Jan Week 4 2014), Embase (1947–Week 5 2014), and the Cochrane Central Register of Controlled Trials (Dec 2013) databases. The search was limited to English. Subject headings and keywords included ‘palliative radiation’, ‘cancer palliative therapy’, ‘bone metastases’, ‘quality of life’, and ‘pain’. All studies (prospective or retrospective) reporting change in QOL before and after palliative radiotherapy for painful bone metastases were included.**Results:** Eighteen articles were selected from a total of 1730. The most commonly used tool to evaluate QOL was the Brief Pain Inventory. Seventeen studies collected data prospectively. An improvement in symptoms and functional interference scores following radiotherapy was observed in all studies. The difference in changes in QOL between responders and non responders was inconsistently reported.**Conclusion:** QOL improves in patients who respond to palliative radiotherapy for painful bone metastases.© 2014 The Authors. Published by Elsevier GmbH. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

## 1. Introduction

Bone is one of the most common sites of metastasis in advanced cancer, present in approximately 50–75% of patients [1]. Bone metastases are especially prevalent in patients with prostate, breast, or lung primaries [2–4] and are of great concern to both physicians and patients as they can result in complications such as pathologic fractures, hypercalcemia, and spinal cord compression [2,5–7]. One of the most common symptoms of bone metastases is pain, occurring in an estimated 70% of patients [8]. Often, patients initially present with multiple bone metastases and often, multiple sites of pain. Pain may be localized or diffuse, and may worsen upon weight bearing [9]. As a consequence of bone pain, patients often have increased difficulty with activities of daily living and decreased quality of life (QOL) [8].

Radiation therapy (RT) is considered to be the standard treatment for cancer patients with symptomatic bone metastases [3,7,10,11]. Various studies have shown that approximately

60–70% of patients experience at least some degree of pain relief following RT, regardless of radiotherapy regime [5,7]. Moreover, about 25% of patients experience complete pain relief, otherwise known as a complete response [2,7]. Although pain relief is a proven benefit of radiation therapy, this is not necessarily indicative of improved QOL.

QOL is a multidimensional model that attempts to capture the physical, social, and psychological well-being of the patient [12]. Many components influence QOL, including physical symptoms of the disease, side effects of treatment, social and family support. Treatment in the advanced cancer population is palliative rather than curative in intent, meaning that the goal is managing symptoms as opposed to prolonging life [7,13]. With this goal in mind, it is important for health care providers to consider treatment in terms of not only managing symptoms, but also stabilizing or improving other factors that affect QOL.

As QOL is a subjective concept, it can be difficult to capture in an accurate and meaningful fashion [12]. Currently, various tools are employed to assess pain and QOL in advanced cancer patients and in those specifically with bone metastases. The European Organisation for Research and Treatment of Cancer (EORTC) has developed one of the most commonly used measurements for this purpose: the QLQ-C30 [13]. Associated with this measurement is

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the QLQ-C15-PAL, a reduced version of the parent QLQ-C30 designed to capture QOL outcomes in a brief internationally recognized and validated tool. The EORTC QLQ-BM22 is a sub-module of the QLQ-C30 and is an internationally recognized and validated scale used to measure QOL in bone metastases patients [7,12].

Another widely used tool is the Brief Pain Inventory (BPI), developed by Cleeland and Ryan. The BPI is a questionnaire used to determine overall pain intensity and functional interference as a result of pain. Specifically, it examines functional interference in terms of general activity, normal work, walking ability, mood, sleep, relations with others, and enjoyment of life [6]. In addition, it captures three aspects of pain: worst, average, and current intensity.

Finally, the Edmonton Symptom Assessment System (ESAS) examines symptoms on a scale of 0, representing 'absence of symptom' to 10, representing 'worst possible symptom' [14]. Symptoms captured in this questionnaire are pain, tiredness, nausea, depression, anxiety, drowsiness, appetite, feeling of well-being, and shortness of breath. In general, symptoms given a rating of 1–3 are considered mild, 4–7 are considered moderate, and 8–10 are considered severe [14].

The objective of this review was to investigate changes in QOL following RT for painful bone metastases. Specifically, we wanted to determine whether or not those who experienced pain relief post-treatment also experienced a positive response in QOL compared to non responders.

## 2. Methods

A literature search was conducted using OvidSP Medline (1946–Week 4 2014), Embase (1947–Week 5 2014), and the Cochrane Central Register of Controlled Trials (Dec 2013) databases. The search was limited to English. Subject headings and keywords utilized for the search included 'palliative radiation', 'cancer palliative therapy', 'bone metastases', 'quality of life', and 'pain'.

Any publication which reported change in QOL using a validated scale following RT was included in this review. Exclusion criteria were literature reviews and articles that discussed QOL solely before radiation treatment, as well as those which only discussed pain. Titles and abstracts of articles generated in the initial search were independently screened by RM and GB and potential articles were identified. Articles were then retrieved and examined further for relevancy.

## 3. Results

The literature search resulted in a total of 1730 articles. Eighteen of these articles, published between 1977 and 2013, met the eligibility criteria [1,3,4,7,8,11–22]. All studies collected data prospectively, except for that by Gilbert et al. [20] who determined QOL through chart review. Only 3 of the studies were randomized control trials [3,21,22], while the rest employed no other intervention than the questionnaire.

The most commonly used tool was the BPI, used in a total of six papers [1,4,10,11,15,16]. The next most commonly used assessment tools were EORTC measures and the ESAS, which were employed in five [7,12,13,18,19] and three [8,14,17] studies, respectively. Other assessment tools included the Patient-Generated Subjective Global Assessment, net pain relief, the McGill–Melzack Score, the Spitzer scale, and others [3,20–22]. In total, eight articles [1,4,7,10,12,15,16,18] directly compared QOL in responders and non-responders, as defined by the International

Bone Metastases Consensus guidelines, while the remaining ten [3,8,11,13,14,17,19–22] made no differentiation between the two patient groups.

### 3.1. Brief Pain Inventory

All of the six articles that utilized the BPI reported at least some improvement in functional interference at one month following radiotherapy for painful bone metastases (Table 1). However, the specific functional items, the degree to which they improved, and whether the improvement was observed in only responders were inconsistently reported among the publications.

Wu et al. [11] published their study in 2006, which investigated pain relief and QOL following RT for patients with bone metastases. These authors reported that there was an improvement in all seven functional items of the BPI one month following treatment; however they did not differentiate between responders and non responders [11]. Nguyen et al. [1] and Hadi et al. [4] also observed an improvement in all functional interference scores post-treatment. It was reported by Nguyen et al. [1] that only mood was significantly related to responders, whereas Hadi et al. [4] concluded that all items except mood, relations with others, and sleep, were significantly related to pain response. Harris et al. [15] found a significant reduction in interference with general activity, normal work, enjoyment of life, and average functional interference in responders. No significant reduction was found for any functional interference scores in patients classified as non responders.

Zeng et al. [10] observed that improvement in all functional interference scores was significantly related to responders, except for sleeping problems at month two and four post treatment. In contrast, Khan et al. [16] reported an improvement in sleep at two and three months post RT in responders. In non responders, sleep was reported to have improved at month one and two, but then worsened at month three.

### 3.2. Edmonton Symptom Assessment Scale

The ESAS was used in three of the 17 included studies, none of which differentiated between responders and non responders. Both Pituskin et al. [8] and Fairchild et al. [14] concluded similar pain response post-treatment, with pain scores decreasing from 6.1/10 and 6.08/10 at baseline, to 2.6/10 and 2.96/10 post-treatment, respectively. In terms of symptoms, Pituskin et al. [8] reported that shortness of breath, nausea, and appetite were the only symptoms that did not show significant improvement at a four week follow-up. Contrastingly, Fairchild et al. [14] found improvement in all symptom severities at weeks one and four post treatment, although improvement was reported as the percentage of patients who experienced symptom relief, with no mention of the statistical significance when compared to baseline.

Chow et al. [17] also utilized the ESAS with a large population of 518 patients. These authors assessed pain and QOL at 1, 2, 4, 8, and 12 weeks post RT and observed an improvement in global pain, index pain, anxiety, and sense of well-being for all patients throughout the follow-up. All articles that employed the ESAS to measure QOL can be found in Table 2.

### 3.3. European Organization for Research and Treatment of Cancer quality of life questionnaires

A total of five studies used EORTC developed questionnaires; three used the QLQ-C30, one used the QLQ-C15-PAL, and one used both the QLQ-BM22 as well as the QLQ-C30 (Table 3). Miszczyk et al. [13] used the QLQ-C30 when evaluating patients who were treated with half-body irradiation for symptomatic bone

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