

Re-Irradiation Spine SBRT in Oligoprogression Breast Cancer: A Case Report

María R Plá^{1*}, Ana Aliaga¹, Verónica González², Eduardo Ferrer¹ and Luis Larrea²

¹Department of Radiation Oncology, Hospital Clínico Universitario de Valencia, Spain

²Department of Radiation Oncology, Hospital Vithas del Consuelo, Spain

*Corresponding author: María R Plá, Department of Radiation Oncology, Hospital Clínico Universitario de Valencia, 46010 Valencia, Spain



ARTICLE INFO

Received: 📅 December 16, 2021

Published: 📅 January 17, 2022

Citation: María R Plá, Ana Aliaga, Verónica González, Eduardo Ferrer, Luis Larrea. Re-Irradiation Spine SBRT in Oligoprogression Breast Cancer: A Case Report. Biomed J Sci & Tech Res 41(1)-2022. BJSTR. MS.ID.006547.

ABSTRACT

Stereotactic body radiotherapy (SBRT) has experienced exponential development in recent years, as its ablative capacity has demonstrated a benefit in certain patients including oligometastatic (OM) and oligoprogressive (OP) patients. We present a case of a 59-year-old woman with a history of infiltrating metastatic ductal breast carcinoma with vertebral bone oligoprogression. After radical surgical treatment and SBRT, a complete response was achieved. After more than two years of follow-up the patient remains with neither local nor distant recurrence. Patients with OM or OP breast cancer are candidates for radical treatment modalities. SBRT has demonstrated promising LC, PFS and OS in these patients. In this context, there are currently ongoing phase III studies in order to provide stronger evidence.

Keywords: Breast Cancer; Oligometastases; Stereotactic Radiation Therapy; Spine SBRT

Introduction

The clinical state of oligometastases was first described by Hellman and Weichselbaum in the 1990s [1]. They suggested that there is an intermediate tumor stage between localized lesions and the widespread metastatic disease and proposed the concept of "oligometastatic disease" (OMD). Some studies have described OMD as a maximum of five treatable lesions. Recently, Guckenberger M, et al. redefined a new OMD classification system [2]. SBRT has experienced exponential development in recent years, as its ablative capacity has demonstrated a benefit in certain patients including OM and OP patients [3]. Oligoprogression is a limited tumor progression in some tumor sites with continued response or stable disease in other sites. SBRT allows the administration of high antitumor biologically effective doses. There are different dose fractionation schemes used depending on the anatomical location, size and tumor histology, among other factors. In general, the most common fractionation used in SBRT is over 6 Gy per fraction

delivered 1-5 fractions. The radical treatment of metastatic lesions includes surgery, radiation therapy and combination therapies.

Case Presentation

We present a case of a 59-year-old woman with a history of infiltrating metastatic ductal carcinoma of the right breast. The subtypes of ER negative, PR 50%, Her2+ and ki-25% were identified at the time of diagnosis in March 2013. CT revealed multiple pulmonary and hepatic metastases. Prior to the diagnoses, the patient started systemic treatment with Navelbine given orally + Herceptin. Following two years with stable disease, on 15 January, CT revealed the progression of a unique bone metastasis of the vertebral column on vertebra T3. MRI confirmed the bone metastasis on the T3 right lateral vertebral body with bulging of the medullary canal. Given the oligoprogression of the disease, a radical treatment with SBRT was performed until reaching a dosage of 18 Gy in a single fraction of the T3 vertebral body at Hospital

Vithas del Consuelo. The spinal cord received a maximum dose (Dmax, 0.01 cc) of 5.7Gy. Following treatment with SBRT, systemic treatment with Navelbine given orally and Herceptin resumed. In February 2019, follow up with CT indicated local progression of the previously treated lesion on vertebra T3. An MRI was performed showing an osteolytic lesion in T3 affecting the body, pedicle, and

right lamina, with an extradural tumor mass occupying the spinal canal in 50% of T3 and medullary compression/deviation from right to left (Figure 1). Based on these findings, the tumor in the spinal canal was resected, with subsequent post-operative SBRT on the surgical site.

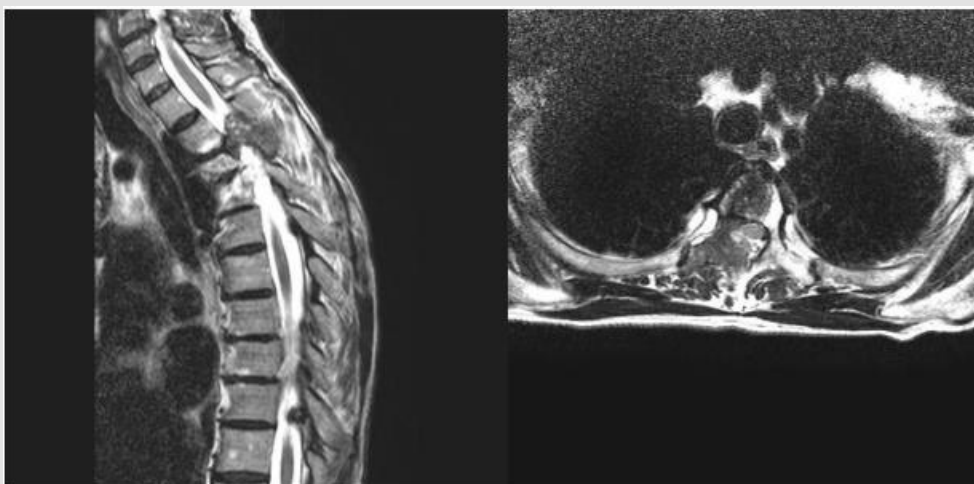


Figure 1: These images represent vertebral metastases before SBRT.

- a) Saggital plane MRI before treatment.
- b) Axial plane MRI before treatment.

On 1 March 2019, the extradural intra-spinal tumor mass was resected, decompressing the spinal cord and separating it from the surgical site using two Teflon sheets (the sheets surrounded the thecal sac). The postoperative period was without complications. After the resection, on 25 March 2019, SBRT was performed on the surgical site of the D3 vertebra. Fixation and immobilization were carried out using a body stereotaxic frame (BodyFix®, Elekta). The simulation was performed by CT and MRI. IRMT was used with

stereotaxic coordinates on the tumor bed until reaching a dosage of 18 Gy in a single fraction (Figure 2). The spinal cord received a maximum dose (Dmax, 0.01 cc) of 7.3Gy. Following treatment with SBRT, the patient resumed systemic treatment with Navelbine given orally and Herceptin resumed. As of the last follow-up on 25 October 2021, the patient remained stable, with no evidence of local or distant progression.

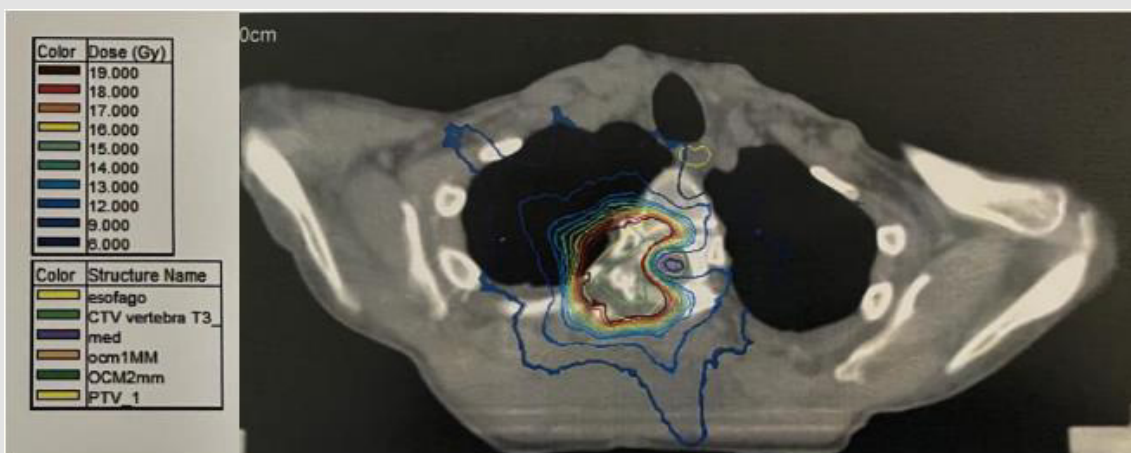


Figure 2: Patient's planning image with dose distribution.

Discussion and Results

Breast cancer (BC) is the most common cancer in women, with 2,26 million estimated new BC cases worldwide in 2020 [4]. Bone is the most common site of metastasis for BC [5]. Nevertheless, metastasis confined to the bone have a more favorable prognosis than other types of distant metastasis [6]. As we previously mentioned, SBRT and its ablative ability offers a greater tumor control compared to conventional palliative radiotherapy (CPR) [3]. A non-systematic review has been carried out on the topic of SBRT targeting oligometastases in BC. Table 1 summarizes the publications reviewed from PubMed database within the last 10 years. The potential benefit of SBRT in oligometastatic BC has

increased the evidence supporting local control (LC), overall survival (OS) and progression free survival (PFS) in these patients. After this review, 12 articles were included, four of them were randomized clinical trials (RCT) [3,7-9], 2 were prospective studies [10,11] and 5 were retrospective studies [12-17]. The sample size is remarkably different among studies ranging from 22 to 227 patients. The follow-up is also distinct ranging from 17 to 73 months. Furthermore, 6 out of 12 articles include multiple histologies [3,7,10,12-14]. LC after SBRT is achieved in 60 to 100% of the cases [10,11], and OS varies from 24 to 50 months [3,18]. When focusing on studies including only BC patients [8,15,9,11,16,17] LC varies from 73% to 100% [8,11].

Table 1: A review of the different retrospective and prospective trials of SBRT in oligometastases breast cancer.

Author	Study type	n	N ^o lesions	Median follow up (months)	Histology	Target	Doses/fraction (Gy/fx)	Groups	Local control	Median survival (months)	PFS	Toxicity ≥ grade 3 (%)
Milano MT, et al. [7]	Prospective	121	NA	41	Various (breast 32%)	Various	50Gy/10fx	SBRT	67% 2y 60% 4y	24	26% 2y 20% 4y	1%
Fumagalli I, et al. [8]	Retrospective	90	139	17	Various (breast 9%)	Liver Lung	27-60Gy/ 1-6fx	SBRT	84.5% 1y 66.1% 2y	34	27% 1y 10% 2y	1%
Bhattacharya IS, et al. [9]	Retrospective	76	76	12.3	Various (breast 18%)	Various	21-405y/ 3-10 fx	SBRT	89%	NA	49.1% 1y 26.2% 2y	4%
Bernard V, et al. [10]	Retrospective	127	148	41.7	Various (breast 20%)	Spine	16-30Gy/ 1-5fx	SBRT	82.6% 1y 75.8% 2y	24.4	NA	6.80%
Scorsetti et al., [11]	Phase II	61	76	73	Various (breast 15%)	Liver	75Gy/3fx	SBRT	94% 1y; 78% 5y	27,6	NR	0%
Milano M, et al. [12]	Phase II	48	59	52	Breast	Various	NA	Bone SBRT vs non-bone SBRT	100% vs 73% 100% 1y	NR [31-200] vs 38	75% vs 42% 38% 1y	NA
Onal C, et al. [13]	Retrospective	22	29	16	Breast	Liver	54Gy/3fx	SBRT	88% 2y	NA	8% 2y 75% 1y	9%
Trovo et al., [14]	Phase II	54	92	30	Breast	Various	30-45Gy/ 3fx	SBRT	97% 2y	NA	53% 2 y	0%
Palma DA, et al. [3]	Phase II	99	NA	51	Various (breast 18%)	Various	RT3D: 8- 30Gy/1-10fx SBRT: 20-35Gy/1-5fx	Palliative standard-of-care vs SBRT all sites	46% vs 63%	28 vs 50	17.3% vs NR	0%
Steven D, et al. [15]	Prospective	15	19	24	Breast	Bone (47% spine)	20Gy/1fx	SBRT	100%	NA	80% 1y 65% 2y	0%
Weykamp F, et al. [16]	Retrospective	46	58	21	Breast	Various	24-60Gy/ 1-10fx	SBRT	92.2% 1y 89% 2y	NA	54% 1y 17% 2y	0%
Lemoine P, et al. [17]	Retrospective	44	NA	40	Breast	Various	40Gy/3fx	SBRT	100%	NA	81% 1y 45% 3y	0%

OS median ranges from 28 to 50 months and it was not reached in one of the studies [8]. PFS varies from 38 to 81% [15,9,16,17] and 2-year PFS from 17,3 to 65% [3,11]. A single study included exclusively bone lesions (47% spine metastases) in BC patients [11]. This prospective study reports up to 100% LC rates and a 2-year PFS of 65% of bone metastases treated with radiosurgery (20Gy in 1 fraction) [11]. Milano M et al. demonstrated a better LC (100% vs. 73%), OS (not reached vs 38 months; $p=0.002$) and PFS (75% vs 42%) after the treatment of extracranial bone lesions compared to those not involving the skeleton (adrenal gland, liver, lung or lymph nodes) [8]. Other authors also report differences in terms of LC depending on the target [3]. Palma et al. reported an improvement in LC (46% vs 63%; $p<0.05$) and OS (28% vs 50%; $p<0.05$) after SBRT to all metastatic sites compared to CPR standard-of-care in oligometastatic patients. No increase in toxicity was observed after SBRT [3]. In this context, Sprave and colleagues showed no detriment in the quality of life (assessed through QOL-BM22, QLQ FA13 and QSC-R10) following SBRT compared to CPR in vertebral metastatic lesions [19]. Grade 3 or higher toxicity reported in the articles reviewed ranges from 0% to 9%. In patients with spinal instability, cord compression, or neurologic deficits, the standard of care is surgery followed by radiation therapy.

Some authors report excellent results with the use of SBRT in patients who have undergone surgical intervention for spine metastases [19,20]. Separation surgery, as our case, refers to providing sufficient surgical circumferential decompression of the spinal cord to create at least 1–2 mm of space between the spinal cord and disease to optimize the SBRT dose distribution. SBRT in oligometastatic patients shows favorable results. In our patient, after radical surgical treatment and SBRT, a complete response was achieved. After more than two years of follow-up the patient remains with neither local nor distant recurrence. Finally, we have to consider that the studies reviewed show heterogeneity both in the target location and treatment site (lung, liver, bone...). Owing to the limitations mentioned above, few robust conclusions can be drawn to the date. There are currently several ongoing clinical trials, such as NRG BR002 (NCT02364557), AVATAR (ACTRN12620001212943) [21] or STEREO-OS (NCT03143322) [19], that will provide more data in relation to the SBRT in oligometastatic BC patients [22,23].

Conclusion

Patients with oligometastatic or oligoprogressive breast cancer are candidates for radical treatment modalities. SBRT has demonstrated promising LC, PFS and OS in these patients with an acceptable toxicity. In this context, there are currently ongoing phase III studies in order to provide stronger evidence.

Funding

The authors received no financial support for the research, authorship and publication of this article.

Conflicts of Interest

The authors declare no conflict of interest.

References

- Hellman S, Weichselbaum R R (1995) Oligometastases. *J Clin Oncol* 13(1): 8-10.
- Guckenberger M, Lievens Y, Bouma A B, Collette L, Dekker A, et al. (2020) Characterisation and classification of oligometastatic disease: A European Society for Radiotherapy and Oncology and European Organisation for Research and Treatment of Cancer consensus recommendation. *Lancet Oncol* 21(1): e18-e28.
- Palma D A, Olson R, Harrow S, Gaede S, Louie A V, et al. (2020) Stereotactic Ablative Radiotherapy for the Comprehensive Treatment of Oligometastatic Cancers: Long-Term Results of the SABR-COMET Phase II Randomized Trial. *J Clin Oncol* 38(25): 2830-2838.
- Nater A, Sahgal A, Fehlings M (2018) Management - spinal metastases. *Handb Clin Neurol* 149: 239-255.
- Ferlay J, Ervik M, Lam F (2020) Global Cancer Observatory: Cancer Today. International Agency for Research on Cancer Accessed.
- Coleman R E (2006) Clinical features of metastatic bone disease and risk of skeletal morbidity. *Clin Cancer Res* 12(20 Pt 2): 6243s-6249s.
- Bernard V, Bishop A J, Allen P K, Amini B, Wang X A, et al. (2017) Heterogeneity in Treatment Response of Spine Metastases to Spine Stereotactic Radiosurgery Within "Radiosensitive" Subtypes. *Int J Radiat Oncol Biol Phys* 99(5): 1207-1215.
- Scorsetti M, Comito T, Clerici E, Franzese C, Tozzi A, et al. (2018) Phase II trial on SBRT for unresectable liver metastases: long-term outcome and prognostic factors of survival after 5 years of follow-up. *Radiat Oncol* 13(1): 234.
- Onal C, Guler O C, Yildirim B A (2018) Treatment outcomes of breast cancer liver metastasis treated with stereotactic body radiotherapy. *Breast* 42: 150-156.
- Shi D, Bai J, Chen Y, Wang X, Zhang Y, et al. (2020) Predicting the Incidence and Prognosis of Bone Metastatic Breast Cancer: A SEER-Based Observational Study. *Biomed Res Int* 2020: 1068202.
- Trovo M, Furlan C, Polesel J, Fiorica F, Arcangeli S, et al. (2018) Radical radiation therapy for oligometastatic breast cancer: Results of a prospective phase II trial. *Radiother Oncol* 126(1): 177-180.
- Milano M T, Katz A W, Muhs A G, Philip A, Buchholz D J, et al. (2008) A prospective pilot study of curative-intent stereotactic body radiation therapy in patients with 5 or fewer oligometastatic lesions. *Cancer* 112(3): 650-658.
- Fumagalli I, Bibault J E, Dewas S, Kramer A, Mirabel X, et al. (2012) A single-institution study of stereotactic body radiotherapy for patients with unresectable visceral pulmonary or hepatic oligometastases. *Radiat Oncol* 7: 164.
- Bhattacharya I S, Woolf D K, Hughes R J, Shah, N, Harrison M, et al. (2015) Stereotactic body radiotherapy (SBRT) in the management of extracranial oligometastatic (OM) disease. *Br J Radiol* 88(1048): 20140712.
- Milano M T, Katz A W, Zhang H, Huggins C F, AuJla K S, et al. (2019) Oligometastatic breast cancer treated with hypofractionated stereotactic radiotherapy: Some patients survive longer than a decade. *Radiother Oncol* 131: 45-51.
- Steven D, Tan J, Savas P, Bressel M, Kelly D, et al. (2020) Stereotactic ablative body radiotherapy (SABR) for bone only oligometastatic breast cancer: A prospective clinical trial. *Breast* 49: 55-62.

17. Weykamp F, König L, Seidensaal K, Forster T, Hoegen P, et al. (2020) Extracranial Stereotactic Body Radiotherapy in Oligometastatic or Oligoprogressive Breast Cancer. *Front Oncol* 10: 987.
18. Thureau S, Marchesi V, Vieillard M H, Perrier L, Lisbona A, et al. (2021) Efficacy of extracranial stereotactic body radiation therapy (SBRT) added to standard treatment in patients with solid tumors (breast, prostate and non-small cell lung cancer) with up to 3 bone-only metastases: study protocol for a randomised phase III trial (STEREO-OS). *BMC Cancer* 21(1): 117.
19. Redmond K J, Sciubba D, Khan M, Gui C, Lo S L, et al. (2020) A Phase 2 Study of Post-Operative Stereotactic Body Radiation Therapy (SBRT) for Solid Tumor Spine Metastases. *Int J Radiat Oncol Biol Phys* 106(2): 261-268.
20. Ameen Al-Omair, Laura Masucci, Laurence Masson-Cote, Mikki Campbell, Eshetu G Atenafu, et al. (2013) Surgical resection of epidural disease improves local control following postoperative spine stereotactic body radiotherapy. *Neuro-Oncology* 15(10): 1413-1419.
21. Lemoine P, Bruand M, Kammerer E, Bogart E, Comte P, et al. (2021) Stereotactic Body Radiation Therapy for Oligometastatic Breast Cancer: A Retrospective Multicenter Study. *Front Oncol* 11: 736690.
22. Sprave T, Verma V, Förster R, Schlampp I, Bruckner T, et al. (2018) Randomized phase II trial evaluating pain response in patients with spinal metastases following stereotactic body radiotherapy versus three-dimensional conformal radiotherapy. *Radiother Oncol* 128(2): 274-282.
23. Alomran R, White M, Bruce M, Bressel M, Roache S, et al. (2021) Stereotactic radiotherapy for oligoprogressive ER-positive breast cancer (AVATAR). *BMC Cancer* 21(1): 303.

ISSN: 2574-1241

DOI: 10.26717/BJSTR.2022.41.006547

María R Plá. Biomed J Sci & Tech Res



This work is licensed under Creative Commons Attribution 4.0 License

Submission Link: <https://biomedres.us/submit-manuscript.php>



Assets of Publishing with us

- Global archiving of articles
- Immediate, unrestricted online access
- Rigorous Peer Review Process
- Authors Retain Copyrights
- Unique DOI for all articles

<https://biomedres.us/>