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## Use of VMAT in breast cancer with regional lymph node involvement and simultaneous integrated boost (SIB) comparing to 3D conformal radiotherapy

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Boost of the surgical tumor bed has shown benefit in reducing the risk of local relapse in lumpectomy and new techniques of radiotherapy allow their incorporation simultaneously to the treatment of the breast. Furthermore, if we must treat regional lymph node chains, OAR toxicity can make us lose coverage of our volume of treatment so these techniques become more important. The aim of this study is to evaluate the potential advantage of Volumetric Modulated Arc Therapy (VMAT) over 3D conformal radiotherapy (3DCRT) in the treatment of breast cancer with regional node involvement and simultaneous integrated boost (SIB) of the tumor bed with respect to volume coverage and doses to Organs at Risk (OAR). Two techniques were compared in 15 patients. Treatment schedule consisted of 50Gy/2Gy daily to breast and regional nodes and SIB over tumor bed to 60Gy (BED 66Gy 2Gy/ daily fr.) all in 25 fractions. 3DCRT employed 6 to 8 coplanar hemifields with one isocenter and VMAT was developed with a restriction of the angulations for the arc to 200º-220º avoiding contralateral breast. Target coverage and dose to (OAR) were analyzed using mean dose, % of the prescribed dose to 9 % of the target volumes, heterogeneity and Quantitative Analyses of Normal Tissue Effects in the Clinic (QUANTEC) constraints respectively. Although we did not have significant differences in the coverage of PTV, we got better homogeneity in planning target volume (PTV) with VMAT and the greatest benefit was obtained with the dose delivered to ipsilateral lung with a decrease of at least 10% in V20 that always was below 25% in VMAT technique. We consider VMAT as most appropriated technique for these treatments.

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## Hetero-radionuclidic-phosphonate framework as a novel agent for pain palliation and PET imaging of metastatic bone

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Many radionuclides have been applied in preparation of DOTMP-containing Radiopharmaceuticals for treatment of bone metastases. It is vitally important to prepare a formula that makes PET imaging and an effective β-therapy possible, in addition to a reduced molar ratio of bone-seeking agent to the radionuclide. Here MOF concept is contributed to the preparation of a novel theranostic bone-seeking agent with different sizes composed of Cu-64, Y-90, and DOTMP for treatment of bone metastases. The products were characterized (IR, elemental analysis: CHN, ICM-MS, PIXE) and quality-controlled (RTLC). The stability and in vitro hydroxyapatite binding were checked up to one week at 37º C in human serum. Radio-MOF crystals and colloidal radio-MOF particles obtained by varying the synthesizing conditions (including pH and temperature), showed similar IR patterns and similar elemental analysis results. The chemical formula was [1Y-1Cu-1DOTMP] for both. The final product was synthesized at pH=8, stirring at room temperature using carrier free Y-90 and Cu-64 and DOTMP (yield > 99%, RTLC). *In vitro* binding experiments showed acceptable bone-seeking affinity of the prepared formula even after one week of storage in human serum at 37$^0$C. The *in vivo* bone-accumulation investigation of the formula also confirmed the results. Importantly, this is the first study of the usage of MOF concept to provide a high payload of radionuclide for theranostic treatment of bone metastases. The biodistribution studies in mice and PET imaging are planned for future studies. The possibility of β-therapeutic (Y-90) and PET imaging (Cu-64) administrating one highly stable radio-MOF agent is presented.

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