

# **Dosimetric comparison between intensity modulated radiotherapy and volumetric modulated arc therapy in hippocampus sparing in brain metastasis treated by whole brain irradiation and simultaneous integrated boost**

**Ehab Saad<sup>1,2</sup> , Khaled Elshahat<sup>2,3</sup>, Hussein Metwally<sup>2,4</sup>**

<sup>1</sup> Department of Clinical Oncology, and nuclear medicine, Cairo University, Egypt

<sup>2</sup> Department of Radiation Oncology, Dar Al Fouad Hospital, Egypt

<sup>3</sup> Department of Clinical Oncology, Azhar University, Egypt

<sup>4</sup> Department of Clinical Oncology, Fayoum University, Egypt

## **Abstract**

### **Background**

While treating brain metastasis with whole brain radiotherapy incorporating a simultaneous integrated boost (WBRT-SIB), the risk of hippocampus injury is high. The aim of this study is to compare dosimetrically between intensity modulated radiotherapy (IMRT) and volumetric modulated arc therapy (VMAT) in sparing of hippocampus and organs at risk (OARs) and planning target volume (PTV) coverage.

### **Methods**

Sixteen patients presenting with more than one brain metastases were previously treated and then retrospectively planned using VMAT and IMRT techniques. For each patient, a dual Arc VMAT and another IMRT (five beams) plans were created. For both techniques, 30 Gy in 10 fractions was prescribed to the whole brain (WB) minus the hippocampi and 45Gy in 10 fractions to the tumor with 0.5 cm margin.. Dose volume histogram (DVH), conformity index (CI) and homogeneity index (HI) of PTV, hippocampus mean and maximum dose and other OARs for both techniques was calculated and compared.

### **Results**

A statistically significant advantage was found in WB-PTV CI and HI with VMAT than IMRT. There were lower hippocampus mean and maximum doses in VMAT than IMRT. The maximum hippocampus dose ranged between (15.5- 19.2Gy) and between (18.4- 20.6Gy) in VMAT and IMRT, respectively. The mean dose of the hippocampus ranged between (11.5-17.7Gy), and between (13.2-18.3Gy) in VMAT and IMRT, respectively.

### **Conclusion**

Using WBRT-SIB technique, VMAT showed better PTV coverage with less mean and maximum doses to the hippocampus than IMRT. Clinical randomized studies are needed to confirm safety and clinical benefit of WBRT-SIB.