Proposal of technique for whole-brain radiotherapy with hippocampal Sparing

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**Introduction:** Irradiation of the hippocampi is responsible for neurocognitive deficits, whereas metastasis incidence in this part of brain is low [1]. In this study, the objective is to develop a treatment technique with acceptable dosimetric coverage of the brain while minimizing the dose to hippocampi.

**Materials and methods:** Treatment planning of 10 patients was performed. Volumes were delineated according to the RTOG 0933 protocol. The prescribed dose was 30 Gy in 10 fractions and plans were normalized to the average of the PTV, minus the hippocampi's PRV. For each dosimetry, goal was minimize the value of D40% and the maximum dose at hippocampi without unacceptable degradation of PTV's coverage. VMAT technique is proposed with 5 non coplanar arcs. Isocenter is positioned at the gravity center of the two hippocampi. The first pair of arcs consist of two whole arcs with 10° couch rotation and 30° collimator rotation. The second pair of arc is identical but with an opposite rotation of table and collimator. Each arc of one pair has an asymmetric collimation so that one of the jaws, having a direction of movement identical to MLC leaves, is closed about 1 cm from the axis of the beam. The sum of two arcs of one pair covers the PTV. The fifth arc with table rotation and collimator rotation at 90° is an half-arc. It is adjusted so that the edges of jaws with MLC intersect the hippocampal volumes. For each patient, this technique was compared with an usually VMAT technique, based on 2 coplanar wholes arcs in clockwise and counterclockwise directions and collimator rotation at 30° and 330° respectively [2]. For each optimization, we used a dummy structure, between hippocampi, to control the dose.

**Results:** The average gain on the D40% of the hippocampus is 1.5 Gy and 3.2 Gy on the maximum dose. There is also an increase on the D98% of the PTV of 0.7 Gy and a diminution of 0.35 Gy to the D2%. The V95% is improved by 2%.

**Conclusions:** This technique with 5 arcs, although time-consuming during the treatment, seems to show a superiority in the hippocampal avoidance, but also in the covering of whole brain.

**References:**

[1] G. Truc & al., «Quelle place pour l'irradiation panencéphalique avec épargne des hippocampes ?,» Cancer Radiothérapie, n° 117, pp. 419-423, 2013.

[2] V. Prokic & al., «Whole brain irradiation with hippocampal sparing and dose escalation on multiple brain metastases: a planning study on treatment concepts,» Int. J. Radiation Oncology Biol. Phys., vol. 85, n° 11, pp. 264-270, 2013.