**Single Isocenter Dynamic Conformationnal Arctherapy of multiple brain metastases: treatment planning and dosimetric comparison with the Gammaknife.**

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**Introduction**

The « Multiple Brain Mets » software (BrainLab) allows automatic planning of multiple brain metastases treatment using a Single Isocenter Dynamic Conformationnal Arctherapy (SIDCA) on the Novalis TrueBeam STX (Varian). It allows the treatment of up to 15 metastases simultaneously with only 1 isocenter and 5 to 10 arcs, whereas the other reference techniques treat each lesion individually. The aim of this study is to evaluate this novel multiple metastases treatment technique, compared with our reference, the Gammaknife.

**Methods:**
22 patients with between 2 and 12 brain metastases treated with the Gammaknife have been selected and the treatments have been replanned using « Multiple Brain Mets » (20Gy on the reference isodose). For each patient, 3 different templates have been evaluated and customised to ensure an optimal quality of the treatment planning and to spare organs at risk. For each technique (Gammaknife and SIDCA), several dosimetric indexes have been compared using the non-parametric Wilcoxon statistical test.

The data are divided into different groups, in order to evaluate several criteria: number, volume and dimensions of the metastases, cumulated volume of metastases and distance between the metastases and the SIDCA isocenter.

**Results:**

97 lesions have been analyzed. Considering the whole group of studied metastases, the coverage, the selectivity and the Paddick indexes are equivalent for both techniques. Regarding the healthy tissues sparing, the dose gradient and the normal tissue volume receiving at least 12 Gy and 10 Gy are significatively better with the Gammaknife. Mean and maximal doses are lower with SIDCA because of the prescribed dose method. Beam on time is in average 12 times lower with SIDCA. Some different trends appear when the metastases are classified into sub-groups in terms of their size, volume, and distance to the SIDCA isocenter. For lesion volumes higher than 2.5 cc, the normal tissue volume receiving more than 12 Gy exceeds 10 cc, which is the clinical limit.

**Conclusion:**

The SIDCA automated treatment planning reveals difficulties to spare the normal tissue and structures close to the target volume.

For the treatment of multiple brain metastases, the SIDCA technique is interesting for the metastases whose volume is lower than 2.5 cc, distant from each other and from the organs at risk because of the lower dose gradient and the need of adding a 1 mm margin compared to the Gammaknife. It would allow a treatment with coverage and selectivity similar as the one obtained with Gammaknife and a beam on time considerably reduced.