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Hippocampus-sparing volume modulated arc therapy (HS VMAT) for patients with World Health Organization grade II gliomas: a feasibility study

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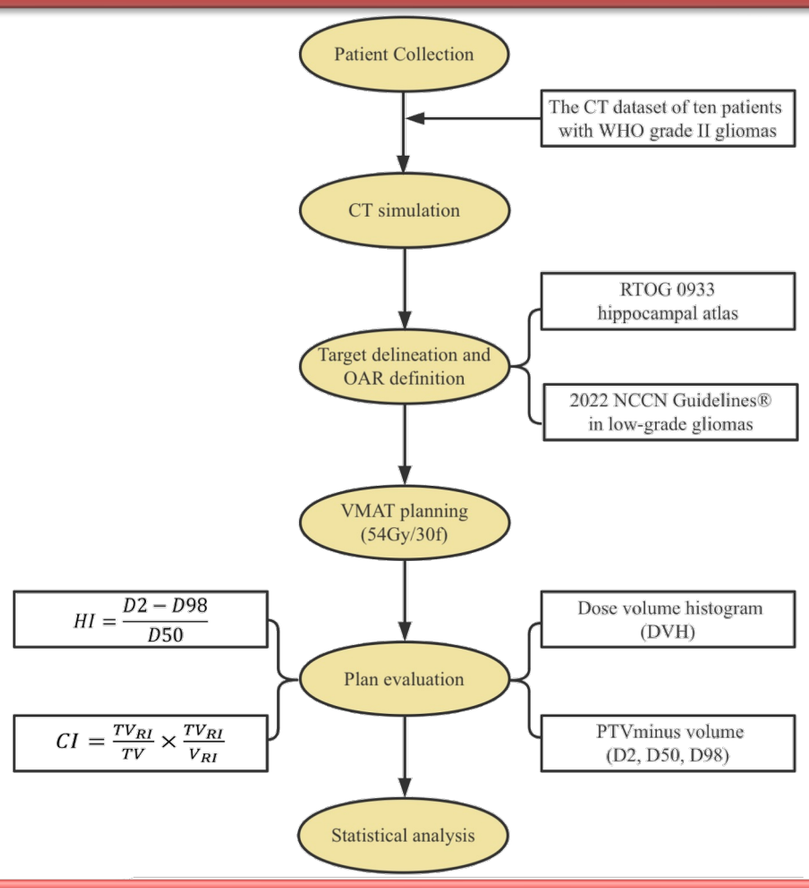
INTRODUCTION & AIM

- Gliomas are one of the original malignant brain tumors[1], the WHO has classified gliomas into four grades, which low-grade were Grade I or II gliomas[2].
- Low-grade gliomas are customarily deemed to be benign for the symptom, but there is potential for cancerous growth[3].
- Radiotherapy (RT) can improve the survival rates of patients with gliomas, but it also impairs cognitive functions[4].
- The hippocampus is regarded as an essential construction for normal cognition[5].
- No further research exploring whether we can minimize the radiation dose to the hippocampus while using volumetric modulated arc therapy (VMAT) as the treatment for gliomas.
- **This study aimed to assess the feasibility of hippocampus-sparing volumetric modulated arc therapy (HS VMAT) in patients diagnosed with WHO Grade II gliomas pathologically.**

METHOD



RESULTS & DISCUSSION

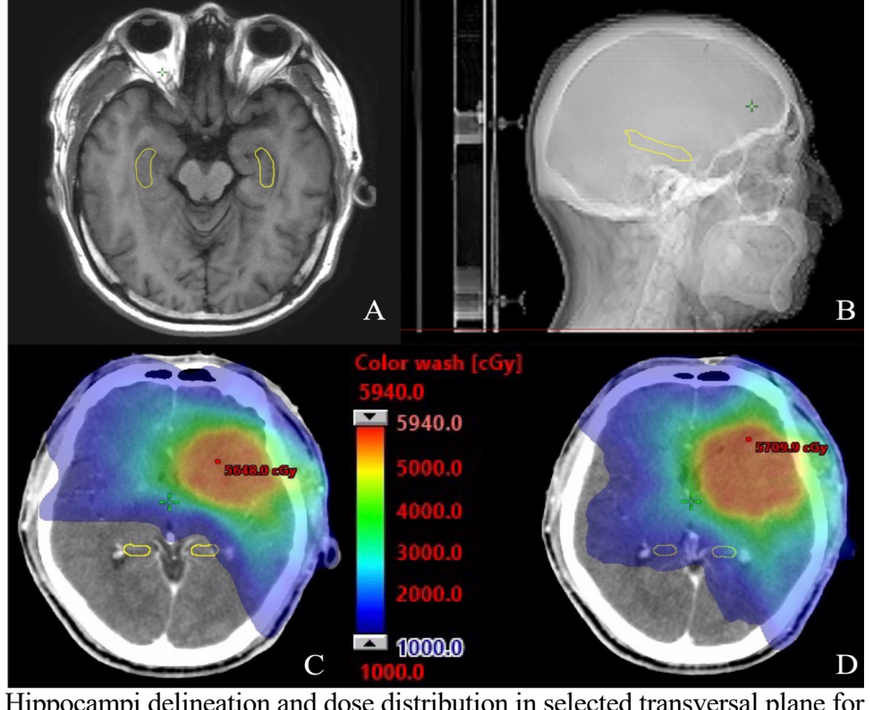


Figure 1. Hippocampi delineation and dose distribution in selected transversal plane for a patient. **A.** Hippocampi delineation in transversal plane, **B.** Hippocampi delineation in sagittal plane, **C.** Dose distribution from HS VMAT plans, **D.** Dose distribution from NHS VMAT plans.

RESULTS & DISCUSSION

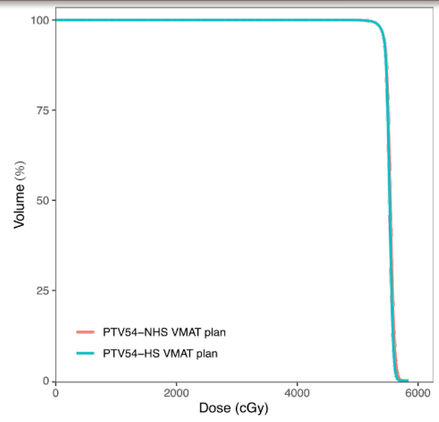


Figure 2. The DVH of PTV.

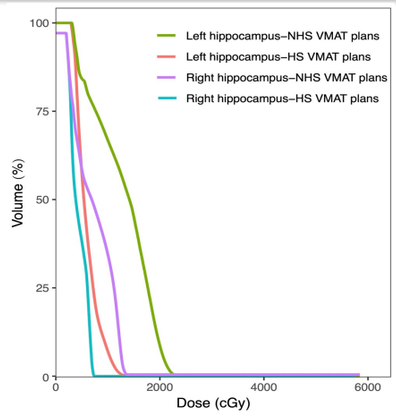


Figure 4. The DVH of bilateral hippocampi.

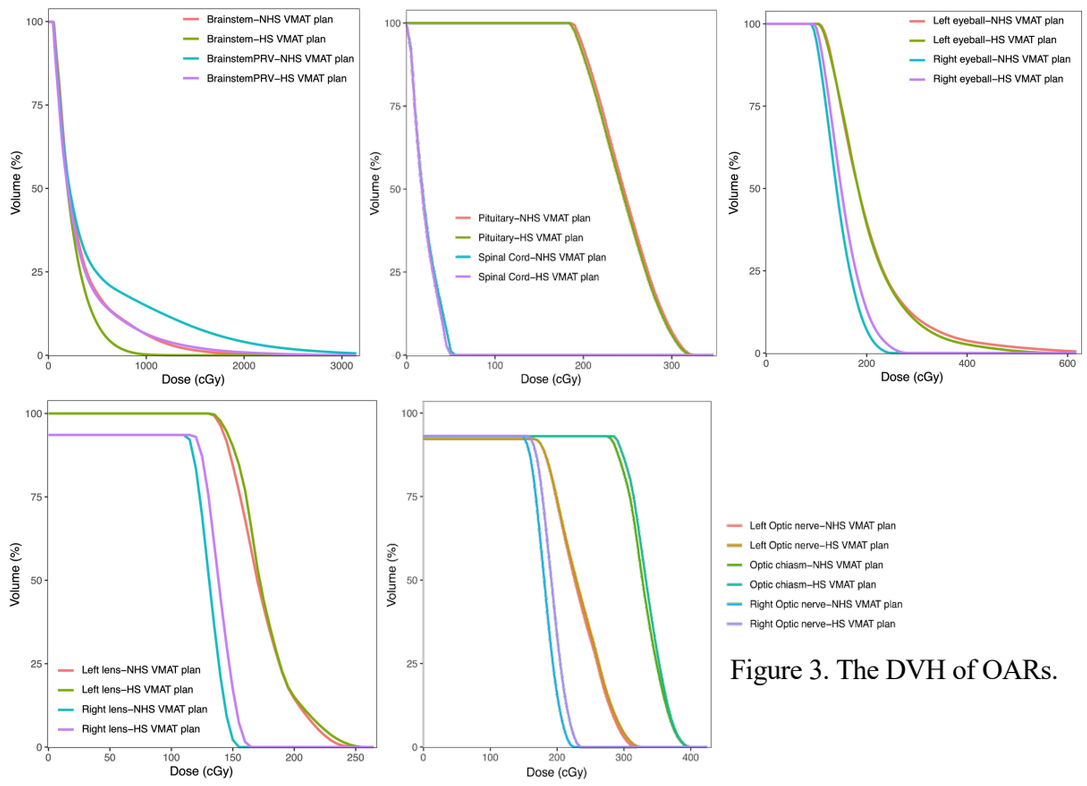


Figure 3. The DVH of OARs.

Table 1. Dosage distribution in PTVminus in NHS VMAT plans and HS VMAT plans

	NHS VMAT (Mean ± SD)	HS VMAT (Mean ± SD)	P-value
PTVminus			
D98 (cGy)	53.51 ± 0.16	53.30 ± 0.35	0.016*
D50 (cGy)	55.05 ± 0.28	55.27 ± 0.27	0.022*
D2 (cGy)	56.03 ± 0.50	56.48 ± 0.51	0.018*
HI	0.046 ± 0.009	0.057 ± 0.014	0.011*
CI	0.92 ± 0.02	0.91 ± 0.02	0.071

NHS VMAT: non-hippocampus-sparing volume modulated arc therapy, HS VMAT: hippocampus-sparing volume modulated arc therapy, PTVminus: PTV minus the overlapping with Brain stem PRV, D98: the dose covered 98% of target volume, D50: the dose covered 50% of target volume, D2: the dose covered 2% of target volume, HI: homogeneity index, CI: conformity index, *: P<0.05, SD: Standard Deviation

CONCLUSION

The use of the HS VMAT plan is a feasible approach for the radiotherapy plan of WHO grade II gliomas, which can effectively reduce the dosage delivered to the hippocampus while not significantly exacerbating the homogeneity index (HI), conformity index (CI), and organs-at-risk (OARs).

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