

**Theme: Clinical****Abstract No: PTCOG-AO2025-ABS-0134****Abstract Title: Proton Therapy for Central Nervous System Germ Cell Tumors (CNSGCT) : A 20-Year Single Institution Experience**Yoon Hwan Byun<sup>1</sup>, Jung Yoon Choi<sup>2</sup>, Dong-Eun Lee<sup>3</sup>, Joo-Young Kim<sup>4</sup>

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**Background / Aims:**

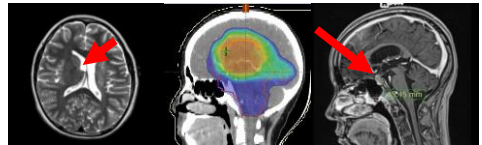
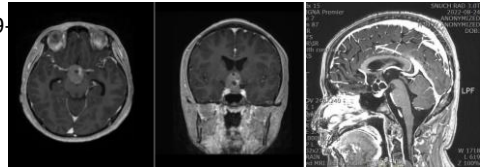
Published studies on proton therapy (PT) for CNS germ cell tumors (CNSGCTs) remain limited. PT is expected to reduce radiation-related toxicity in growing children with brain tumors; however, its highly conformal nature raises concern for marginal misses, particularly in tumors such as CNS germinomas, where even low-dose RT contributes to tumor cell killing. This study presents a 20-year, single-institution experience with PT for CNSGCTs to evaluate treatment patterns and outcomes.

**Subjects and Methods:**

This retrospective study included 128 patients (77 germinomas, 29 NGGCTs, and 22 clinically diagnosed cases) with CNSGCTs who received PT at the National Cancer Center, Republic of Korea, between 2009 and 2024. Seventy-two patients were treated as germinoma, 42 as non-germinomatous germ cell tumors (NGGCTs), and 14 with combined treatment (NGGCT Ctx + germinoma RTx)

**Result:**

- Median follow-up: 85.1 months
- Total of 9 relapses (4 germinoma, 4 NGGCT, 1 combined tx group) and 6 deaths
- Long-term (10 yr) RFS/OS: Germinoma tx group 94.1% / 100%, NGGCT tx group 78.6% / 84.9%, Combined tx group 92.9% / 92.9%
- 73 patients treated with double scattering (2009-2018), 47 PBS (2019~), and 8 with mixed technique(2017-2019).

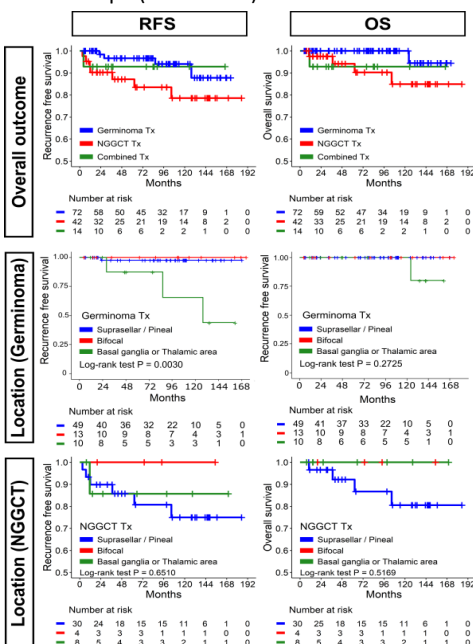
**Case of relapse in basal ganglia germinoma****Case of NGGCT with GTS**

- PT for CNSGCT achieved excellent RFS and OS in both germinoma and NGGCT, and alleviated concerns regarding PBT in treatment of CNS GCT.

- Among 4 germinoma recurrences, 1 was at the TSA site and salvaged; 1 patient developed testicular GCT.
- Basal ganglia germinoma (n=13) had significantly worse RFS vs other sites (p=0.003); 2 relapses occurred within the RT field, indicating the need for adequate RT dosing.

- Four relapses occurred in the NGGCT tx group: 2 primary sites, 1 LMS, 1 distant brain (cerebellum)
- There were 7 patients with GTS; 1 NGGCT and 1 combined tx group patients developed GTS with subsequent leptomeningeal seeding and died.

- Major complications: 2 hematologic second malignancies in germinoma patients, both died.
- 1 patient with MDS, alive.
- Two patients developed benign second tumor; 1 schwannoma at 10<sup>th</sup> cranial nerve, 1 in spinal muscle.
- One 4 year old patient with suprasellar immature teratoma case developed Moyamoya disease after Chemotherapy and 54Gy PBT.

**\* Funding: NCC 2310740/2410942****Summary of survival outcomes (RFS, OS)**

**Abbreviations:** CTx: Chemotherapy; GTS: Growing teratoma syndrome; OS: Overall survival; RFS: Recurrence-free survival; RTx: Radiotherapy; Tx: Treatment;  $\beta$ -hCG:  $\beta$ -human chorionic gonadotropin, LMS: Leptomeningeal seeding