PTCOG-AO2025-ABS-0096

# Significance of Early Proton Beam Therapy Initiation in Achieving Complete Response in Pediatric Medulloblastoma: A Retrospective Study

Shosei Shimizu[*], Zhipeng Shen[1], Hideyuki Sakurai[2]

[*] Department of Pediatric Radiation Therapy Center/Pediatric Proton Beam Therapy Center, Hebei Yizhou Cancer Hospital, China, [1] Department of Neurosurgery, The Children's Hospital of Zhejiang University School of Medicine, China, [2] Department of Radiation Oncology, University of Tsukuba, Japan

**Objectives**

Proton beam therapy (PBT) is a highly effective treatment for pediatric medulloblastoma, offering excellent tumor control and reduced toxicity. However, the optimal interval from surgery to PBT initiation (ISP) remains unclear, and factors influencing tumor response post-PBT are poorly defined. This study aimed to investigate the relationship between ISP and tumor response, particularly the achievement of complete response (CR).

**Methods**

This retrospective study included 52 pediatric patients with postoperative residual medulloblastoma treated with PBT. Tumor response was evaluated based on RECIST criteria at one week before PBT and at treatment completion. Patients were classified as CR, partial response (PR), or stable disease (SD). The primary objective was to assess the association between ISP and CR, with secondary analysis of other variables related to tumor response.

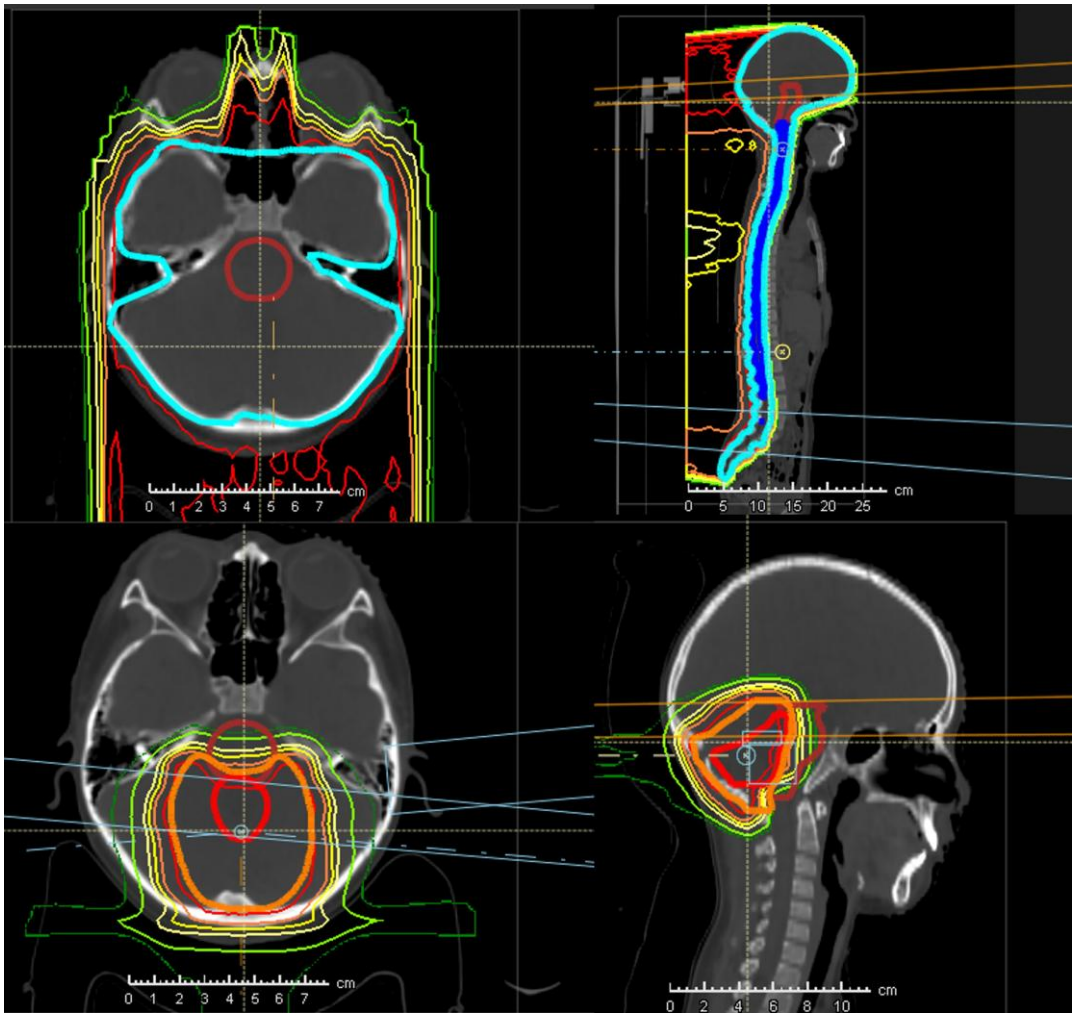
**Results**

The median follow-up was 12.5 months (range, 5.3–20.3). CR was observed in 26 patients (50.0%), PR in 15 (28.85%), and SD in 11 (21.15%). Patients who initiated PBT within 31 days of surgery had a significantly higher CR rate (74.1%) compared to those with longer ISPs (24.0%, $p < 0.001$). Shorter ISP was significantly associated with better tumor response (mean 30.15 ± 5.31 days, $p < 0.001$). Longer ISPs were associated with higher rates of PR (32.00%) and SD (44.00%).

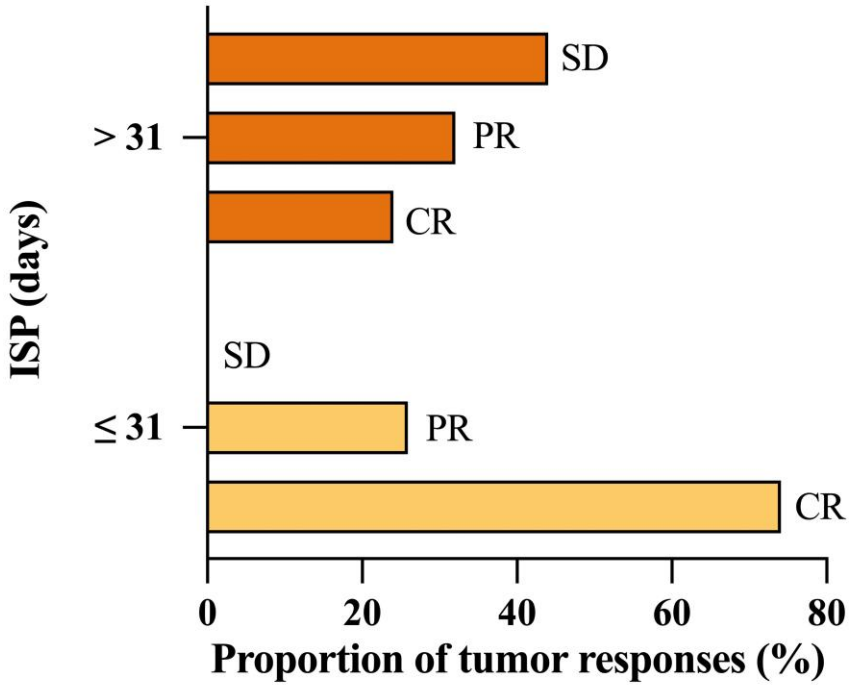
Univariate logistic regression revealed that Chang stage M3 (odds ratio [OR] = 0.103, $p = 0.046$), residual tumor diameter >1.5 cm (OR = 0.278, $p = 0.043$), and longer ISP (OR = 0.906, $p = 0.013$), especially over 31 days (OR = 0.111, $p = 0.001$), were significantly linked to reduced CR. Multivariate analysis confirmed ISP as the only independent factor significantly associated with CR (OR = 0.884, $p = 0.009$).

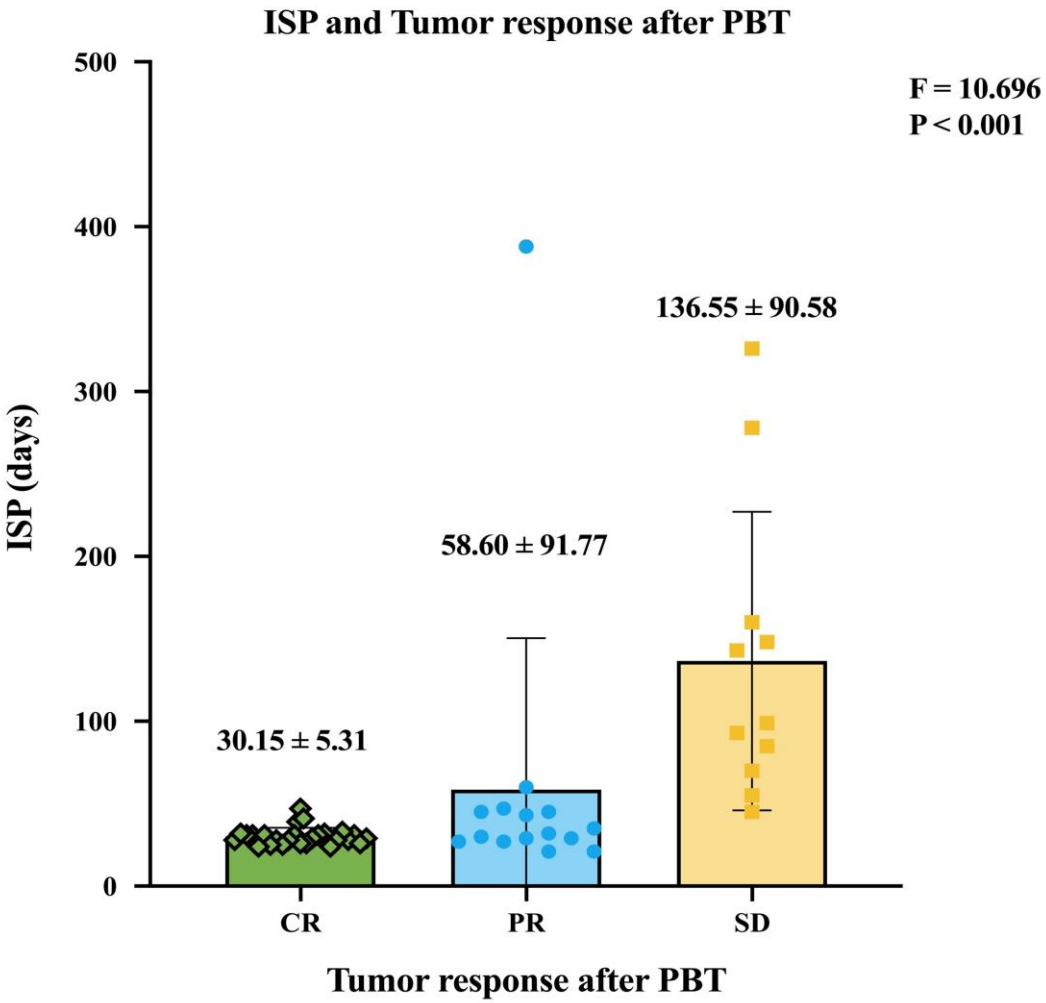
**Conclusions**

This is the first study to define the optimal timing for PBT initiation in pediatric medulloblastoma with residual tumor. An ISP of ≤31 days was strongly associated with CR and may serve as a key predictor of treatment success. Early PBT initiation is crucial for improving outcomes and maximizing the likelihood of CR.



**Proportion of tumor responses at ISP greater or less than 31 days**




ISP and Tumor response after PBT
F = 10.696
P < 0.001
500
400
300
200
100
0
ISP (days)
136.55 ± 90.58
58.60 ± 91.77
30.15 ± 5.31
CR
PR
SD
Tumor response after PBT