Pseudoprogression After Proton Therapy of Pediatric Spinal Pilocytic Astrocytoma and Myxopapillary Ependymoma

Sofía Ramírez Mateo[1,2], Jason Johnson[3], Stephen F. Kralik[4], David R. Grosshans[1], Mary Frances McAleer[1], Wafik Zaky[5], Patricia A. Baxter[6], Frank Y. Lin[6], Murali Chintagumpala[7], Arnold Paulino[1] and Susan L. McGovern[1]

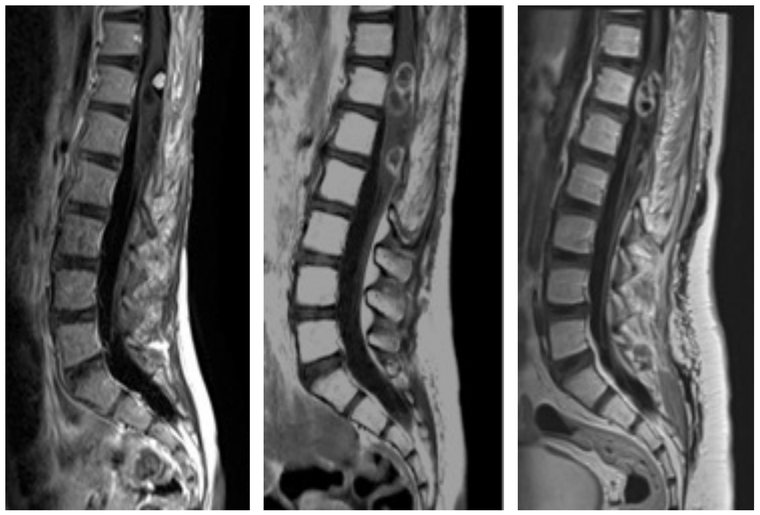
[1]Department of Radiation Oncology, MD Anderson Cancer Center, [2]Universidad Central del Caribe, [3]Department of Neuroradiology, MD Anderson Cancer Center, [4]Department of Radiology, Texas Children's Hospital, [5]Department of Pediatrics, MD Anderson Cancer Center, [6]Department of Pediatrics, Baylor College of Medicine, [7]Texas Children's Cancer Center, Baylor College of Medicine

Introduction

- Proton therapy is increasingly used to treat spinal tumors in children.
- Pseudoprogression is a post-radiation increase in tumor size with subsequent decrease in size without additional tumor-directed therapy.
- Pseudoprogression can be clinically symptomatic and difficult to differentiate from true progression.
- The rate of pseudoprogression after proton therapy of pediatric spinal tumors is unknown.
- Pseudoprogression after proton therapy of CNS tumors is a challenging clinical situation.

Materials/Methods

- A retrospective review of demographics, treatment characteristics and occurrences of pseudoprogression was made for pediatric patients with spinal pilocytic astrocytoma (sPA; n = 11) or myxopapillary ependymoma (MPE; n = 10) with gross disease treated with proton therapy with at least 6 months of follow up from completion of proton therapy
- Statistics: Fisher's exact test with a 2x2 contingency table to obtain a two-tailed p-value



Before protons 3 months after protons 2 months later

Figure 1. PsP of spinal PA after PBRT

- Median follow up after proton therapy was 44 months (range, 9 – 99 months).

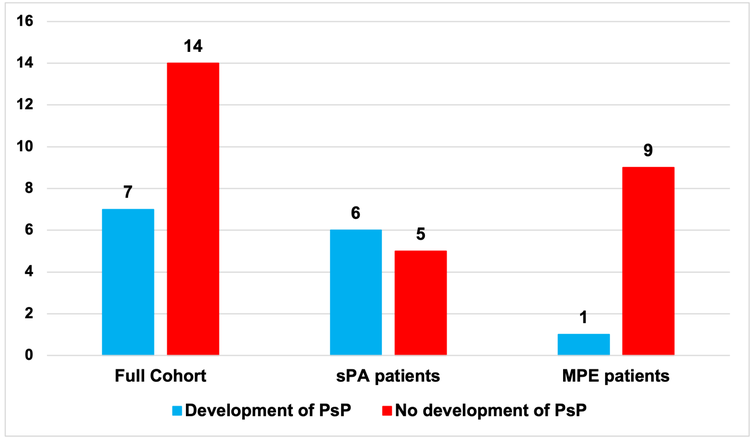


Figure 2. Number of patients that developed or didn't develop PsP by histology

Results

- Twenty-one patients were treated with proton therapy. PsP was identified in 7/21 patients (33%): 6/11 sPA patients (55%) and 1/10 MPE patients (10%).
- Median age at RT for the cohort was 10.1y (range, 5.9 – 16.8y), 10.1y (range, 5.9 – 16.2y) for sPA patients and 10.65y (range, 7.2 – 16.8y) for MPE patients.

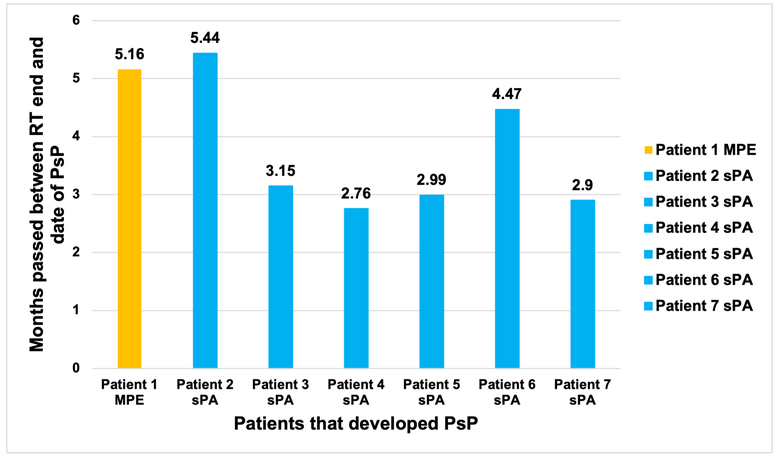


Figure 3. Months passed between RT end date and PsP date

- Pseudoprogression occurred at a median of 3.15 months (range, 2.76-5.44 months, standard deviation, 1.15 months) after proton therapy.

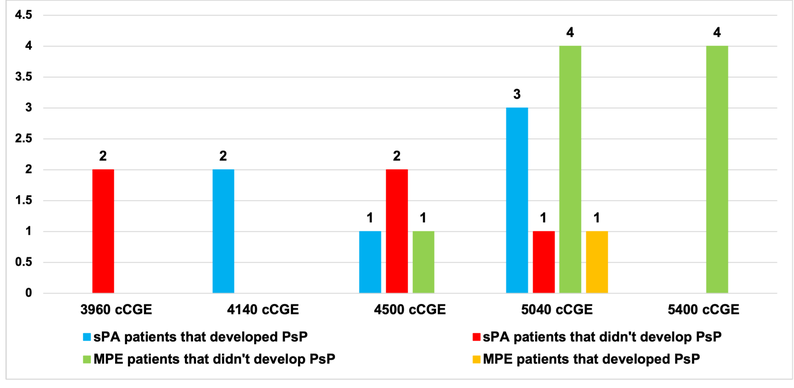


Figure 4. Number of patients that developed or didn't develop PsP at dosage range of RT for full cohort by histology

- Median dose for the cohort was 50.4 GyRBE (range, 39.6 – 54 GyRBE, 45 GyRBE (range, 39.6 – 50.4 GyRBE) for sPA patients and 50.4 GyRBE (range, 45 – 54 GyRBE) for MPE patients.
- Minimum RT dose for PsP was 4140 cCGE.
- Of patients receiving at least 4140 cCGE, PsP was more common in patients with sPA (6/9 = 67%) than MPE (1/10 = 10%; $p < 0.02$).
- Three sPA patients with pseudoprogression were symptomatic and improved with medical therapy.

Conclusions

- Preliminary analysis suggests that pseudoprogression occurs frequently within 6 months after proton therapy for sPA and infrequently after proton therapy for MPE.
- Pseudoprogression rates increased above doses of 3960 cCGE.