

Barriers to receiving proton-craniospinal irradiation for pediatric medulloblastoma patients in a state without proton access

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PURPOSE / OBJECTIVES

- Medulloblastoma is the most common pediatric brain malignancy, representing approximately 20% of all brain tumors found in children (1) and 40% of all posterior fossa tumors (2)
- Treatment of medulloblastoma is multi-modal, including surgery, chemotherapy, and craniospinal irradiation (CSI) (3)
- Long term toxicities of CSI include ototoxicity, cardiotoxicity, endocrine, neurocognitive dysfunction, and growth impairment (4)
- The standard of care for CSI has evolved to favor proton beam therapy over photon-based CSI (4-8)
- Meta-analysis of studies comparing photon and proton-CSI predicted better dose distribution, decrease in organ dysfunction, and less secondary malignancy with proton-based CSI (4)
- Here, we conducted a retrospective study identifying access barriers to proton-CSI for medulloblastoma patients in a tertiary care center serving patients in a state without a proton center

MATERIAL & METHODS

- We conducted an IRB-approved retrospective study using patients diagnosed with medulloblastoma from a pediatric tumor registry at a tertiary care center which serves surrounding rural counties
- Eligible patients were diagnosed with medulloblastoma at our institution between 2000-2022 and were aged ≤ 25 at the time of diagnosis
- Dichotomous variables were compared to outcomes using the Fisher's Exact test. Continuous variables were compared using the Kruskal-Wallis test
- All statistical analyses were conducted in IBM SPSS Statistics for Windows (Version 28.0. Armonk, NY: IBM Corp) with 95% CIs

RESULTS

- Of 18 total patients, 3(17%) received proton-CSI and 15(83%) did not. Of these 18 patients, 11(61%) patients had documented discussions about proton-CSI in their medical records, while 7(39%) did not
- Four (22%) experienced insurance approval barriers, 3(17%) could not afford travel, 3(17%) had lack of transportation, 1(6%) had parents unable to travel with them, 4(22%) had family care conflicts, 4(22%) had inpatient medical needs, 5(28%) had outpatient medical needs, and 3(17%) had a delay of therapy
- No significant associations were found between sex, race, estimated travel distance, median household income based on county, parent employment and marital status, tumor classification, and risk stratification and the reception of proton-CSI or its discussion
- Although Fischer's test demonstrated a non-significant association ($p=0.22$), chi-square analysis demonstrated that both employment status ($p=0.09$) and marital status ($p=0.09$) approached significance
- Median distance from our institution approached significance ($p=0.07$) by race, with Caucasians having longer travel distances

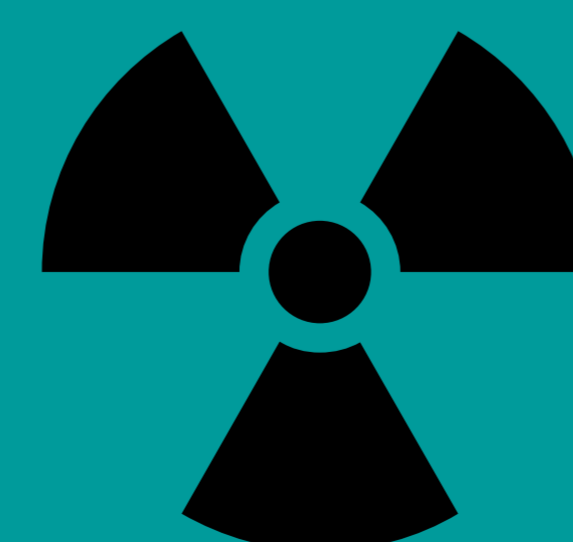
SUMMARY / CONCLUSION

- This is the first exploratory analysis on barriers to proton-CSI for patients in a state without access to this treatment modality
- This study provides insight into barriers, including marital status and parent employment encountered by pediatric patients and their families and, therefore, may aid clinicians in mitigating these barriers
- Overcoming these barriers may allow for optimal treatment and may reduce the risk of CSI-induced secondary malignancy and toxicity

Although studies have analyzed barriers to pediatric patients receiving proton therapy, these are studies from authors at proton centers. This study analyzes barriers from the perspective of a population in a state that does not have adequate access to protons



Median distance from our institution approached significance upon stratification by race ($p=0.07$)



RESULTS

Table 1. Selected barriers to proton-CSI based on radiotherapy modality

Sub-group of Interest	Sex	Race	Median Distance from our Institution	Median Household Income	Parent Marital Status	Parent Employment Status	Tumor Classification	Risk Stratification
Received proton-CSI (n = 3)	2 Males	3 Caucasians	71.8 miles	\$52,124	3 Married	0 Both employed	2 Classic	3 Standard
	1 Female	0 Non-Caucasian	82 minutes		0 Divorced/Separated	3 Other	1 Non-Classic	0 High
Did not receive proton-CSI (n = 15)	9 Males	10 Caucasians	57.9 miles	\$52,124	7 Married	8 Both Employed	5 Classic	13 Standard
	6 Females	5 Non-Caucasian	68 minutes		8 Divorced/Separated	7 Other	10 Non-Classic	2 High
Significance of Association	Fisher's $p = 1.00$	Fisher's $p = 0.52$	Kruskal-Wallis $p = 0.44$	Kruskal-Wallis $p = 0.81$	Fisher's $p = 0.22$	Fisher's $p = 0.22$	Fisher's $p = 0.53$	Fisher's $p = 1.00$

Table 2. Selected barriers to proton-CSI based on race

Sub-group of Interest	Median Distance from our Institution	Median Household Income	Parent Marital Status	Parent Employment Status	Tumor Classification	Risk Stratification
Caucasian (n=13)	72.1 miles	\$54,732	8 Married	5 Both Employed	5 Classic	11 Standard
	85 minutes		5 Divorced/Separated	8 Other	8 Non-Classic	2 High
Non-Caucasian (n=5)	21.5 miles	\$45,766	2 Married	3 Both Employed	2 Classic	5 Standard
	26 minutes		3 Divorced/Separated	2 Other	3 Non-Classic	0 High
Significance of Association	Kruskal-Wallis $p = 0.07$	Kruskal-Wallis $p = 0.197$	Fisher's $p = 0.61$	Fisher's $p = 0.61$	Fisher's $p = 1.00$	Fisher's $p = 1.00$

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