CaRRE, Carbon Radiotherapy for Rare Tumors: Electronic Consent and Follow-up

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BACKGROUND

Unresectable adenoid cystic carcinoma (ACC) of the head and neck (H&N) is a rare tumor with limited research and poor patient outcomes. Prospective clinical studies for such rare tumors are difficult to conduct due to significant costs and challenges in enrolling sufficient patient numbers. Consequently, outcomes for affected patients remain poor, with current treatments using photon/proton radiation achieving suboptimal local control rates of 50-60% at three years, with local recurrences being the primary cause of mortality[1]. High Linear Energy Transfer (LET) radiation, such as fast neutron therapy, has shown improved efficacy but poses significant toxicity risks[2]. Carbon ion radiotherapy (CIRT), a high LET radiation with better conformality, has emerged as a preferred treatment option in Europe and Asia, achieving 2-year local control rates of 80-90% and is recognized by NCCN guidelines as appropriate for unresectable ACC[3]. Mayo Clinic Florida (MCF) is pioneering the establishment of the first CIRT center in North America, expected to begin treating patients in 2028. However, North American patients currently lack access to this treatment modality.

FIGURE 1

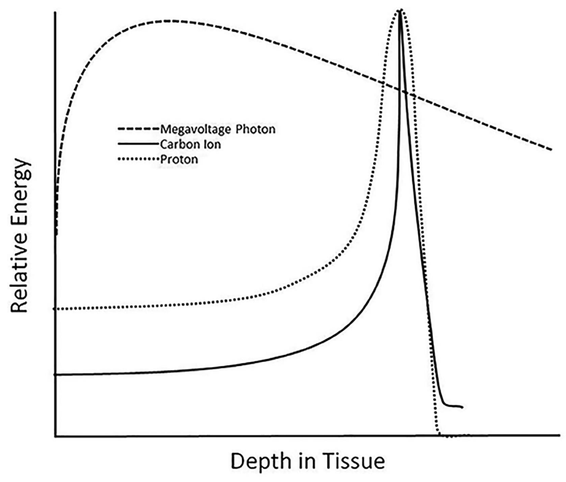

Figure 1. Dose deposition at depth for 6MV photons, protons, and carbon ions.

FIGURE 2

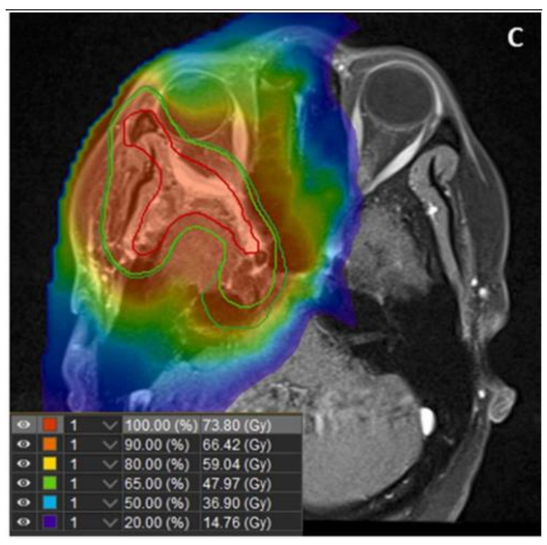

Figure 2. Colorwash Dose Distribution for treatment of ACC of H&N with perineural invasion using particle therapy.

OBJECTIVES

- **Primary Aim:** Prospectively report on two-year local control of patients from the USA treated with combined modality therapy using CIRT boost compared to historical comparisons and a prospectively obtained registry cohort
- Address critical care gap in the treatment of unresectable adenoid cystic carcinoma of the head and neck
- Evaluate long-term outcomes of CIRT including toxicity, progression-free survival, and overall survival

METHODS

- Prospective two-arm clinical trial to investigate the benefits of CIRT boost combined with standard photon/proton radiation for patients with unresectable ACC of the H&N
- Study will leverage novel clinical trial infrastructure designed to minimize cost, personnel requirements, enabling virtual enrollment, and treatment
- Group 1: 25-30 treatments of photon/proton therapy (45-50GyRBE) at partner institution followed by CIRT boost of up to 8 treatments (24GyE at 3GyE)
- Group 2: unable to travel, enrollment in prospective registry component
- 14 participants will be required in each group totaling 28 patients
- Secondary endpoints: patient quality of life, patient-reported outcomes, progression-free survival, overall survival
- Powered to detect difference in primary endpoint: two-year local control (LC) rate between patients treated with and without CIRT
- Local disease progression will be assessed using clinical or radiographic exam as per RECIST 1.1 criteria.

SCHEMA

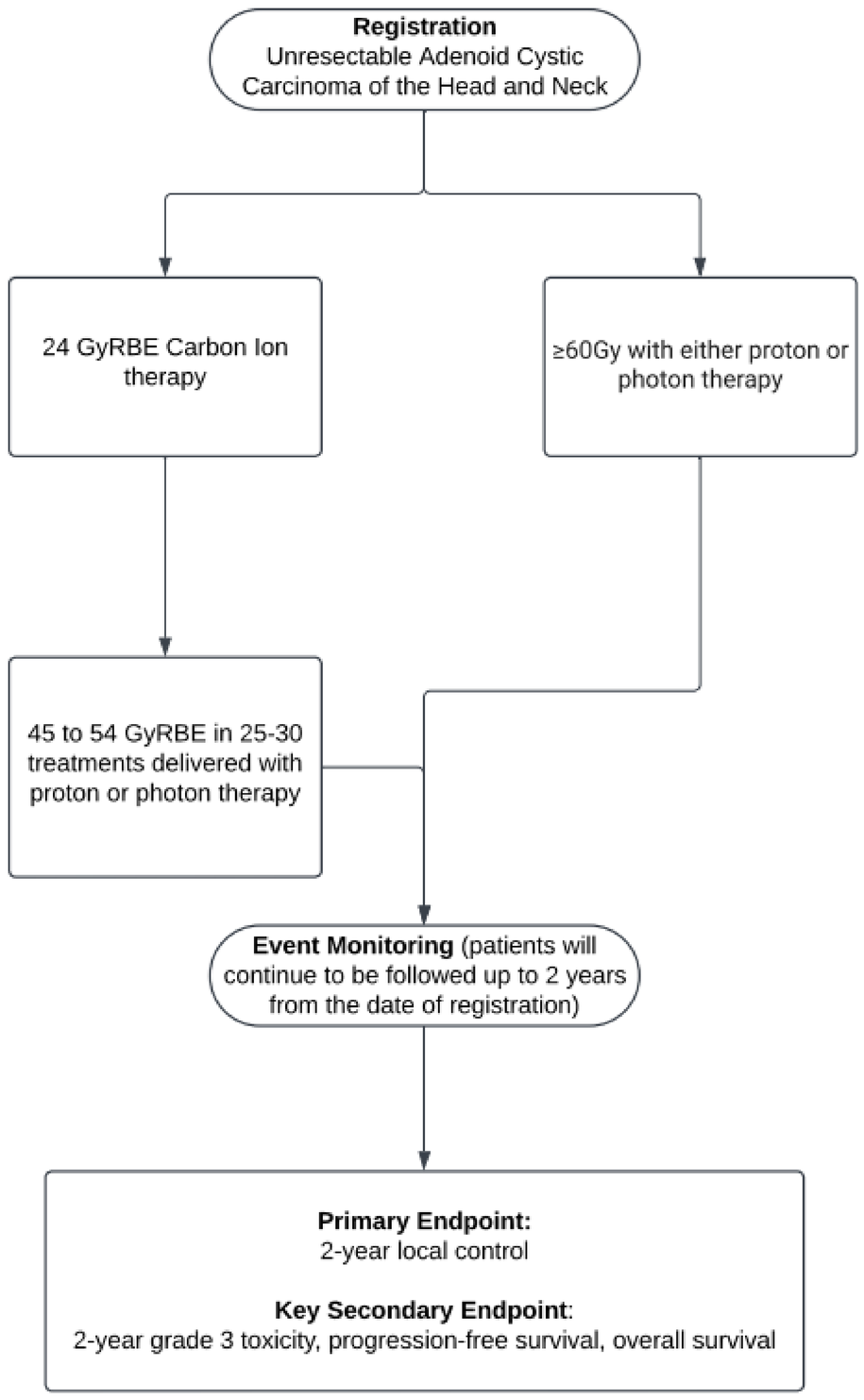

FIGURE 3

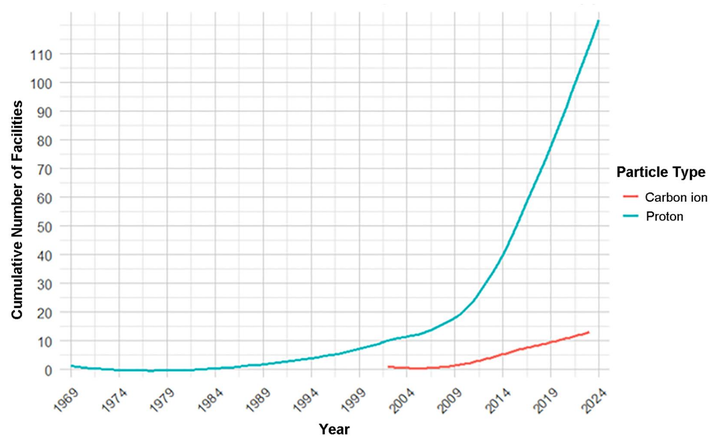

Figure 3. Comparison of number of carbon ion facilities versus proton facilities since 1969.

FIGURE 4

Figure 4. Development of CIRT center.

DISCUSSION

- Based on literature estimates, two-year LC for patients treated with photon/proton radiation is ~50%, compared to 90% for those treated with combination CIRT
- This approach promises to transform the therapeutic landscape for rare tumors by developing a referral base, generating US-based evidence, and facilitating reimbursement
- Evaluation of success of CIRT boost on LC of ACC of the H&N and establishing USA evidence, may cause the need for increased access to this type of therapy in North America may be seen with increased urgency.

CONCLUSIONS

- This study will provide a platform for decentralized multinational, multi-institutional trials
- Allow for increased study accrual for patients with other rare tumors beyond those with ACC if this study is successful

REFERENCES

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