

Introduction

Atypical and anaplastic/malignant meningiomas (WHO Grades II-III) are aggressive tumors that recur despite resection and radiation, and do not respond well to chemotherapeutics. Thus, implantation of 125-Iodine brachytherapy seeds into the resection cavity has been used to augment surgical treatment. Here, we report the results of patients treated at our institution over a 25-year period.

Methods

Charts of patients treated at the University of California, San Francisco who underwent surgical resection and interstitial placement of 125-I brachytherapy sources for atypical and malignant meningioma between 1988-2013 were reviewed to determine progression free survival, survival after brachytherapy and overall survival. Kaplan-Meier actuarial method was used to calculate progression free and overall survival. Log-rank comparisons between curves were performed.

Results

Forty-two patients with high grade meningioma underwent surgical resections with 125-I brachytherapy. All patients had prior resections and 35 had prior radiation. At the time of brachytherapy, 13 patients had gross total resection, while 28 had subtotal resection.

Results (continued):

Median time to progression after resection with 125-I brachytherapy was 8.9 months for atypical meningioma, 9.0 months for malignant meningioma ($p = 0.69$), and 8.95 months for the combined groups. Median survival after 125-I brachytherapy was 3.5 years for subjects with atypical meningioma, 2.4 years for subjects with malignant meningioma ($p = 0.78$), and 3.3 years for all subjects. Median overall survival after diagnosis was 11.5 years for subjects with atypical meningioma, 8.0 years for subjects with malignant meningioma ($p = 0.27$), and 9.4 years for all subjects. Complications included radiation necrosis (8), wound breakdown (6), hydrocephalus (4), infection (3), and a meningocoele (1).

Demographics

- Patients: 42
- Resections with 125-I implant: 50
- Age diagnosis (yr): 32-73
- Age brachytherapy (yr): 37-78
- Male: 23
- Female: 19
- Median prior resections: 2

Adjuvant Radiation Therapy

- EBRT Before Brachy: $n=35$, 83%
- SRS Before Brachy: $n=16$, 38%
- SRS After Brachy: $n=19$, 45%

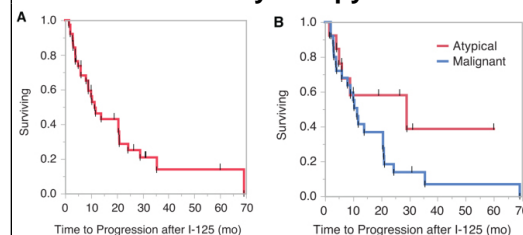
Pathology

- Atypical Meningioma: 14
- Malignant Meningioma: 28

Extent of resection with brachytherapy:

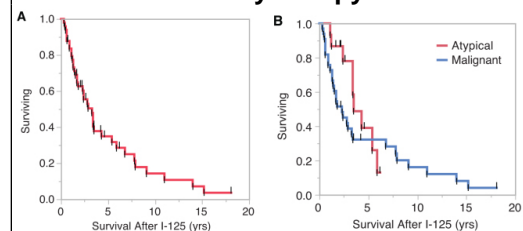
- Subtotal: 31
- Gross total: 17

Median Time to Progression after Brachytherapy



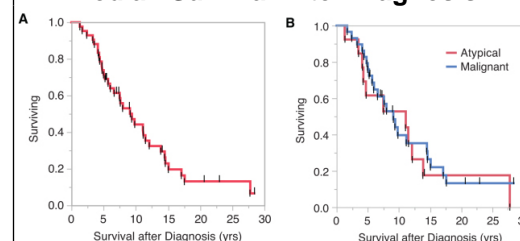
Time to progression (mo): A) All patients, median 11.4 months. B) By pathologic grade, atypical 20.9 months, malignant 11.4 mo ($p = 0.15$)

Median Survival after 125-I Brachytherapy



Median Survival after 125-I Brachytherapy: A) All patients, 3.3 yrs. B) By pathologic grade, atypical, 3.5 yrs; malignant, 2.3 yrs, ($p = 0.37$)

Median Survival After Diagnosis



Median Survival after diagnosis: A) All patients, 9.4 yrs. B) By pathologic grade, atypical 11.1 yrs; malignant, 9.1 yrs ($p = 0.58$)

Complications:

- Complications (n, %): 16, 38%
- Complication Types:
- Radiation Necrosis: 8
 - Wound Breakdown: 6
 - Hydrocephalus: 4
 - Wound Infection: 3
 - Pseudomeningocele: 1

Conclusions

These results are the largest case series of local brachytherapy with radioactive iodine sources as an adjuvant to resection for patients with high grade meningiomas.

The favorable survival outcomes support the use of adjuvant brachytherapy as an option when treating these aggressive tumors at recurrence, however, caution must be used as there is a significant rate of complications associated with repeated surgery and use of brachytherapy.

Future directions include developing a multi-institutional trial to evaluate Cs-131 sources for the treatment of recurrent high grade meningiomas.