

Minimal Increase in contrast enhancement after chemo-radiotherapy (CRT) for glioblastoma predicts worse survival and progression-free survival

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Purpose/Objectives

- Assessment of treatment response and progression is suboptimal in glioblastoma (GBM).
- In the context of pseudo-progression, radiographic change is a challenging parameter to assess.
- Based on unpublished data from Gzell et. al., a novel method for measurement of contrast enhancement demonstrates promise in predicting survival.
- We aim to determine if early measurement of radiographic change post-CRT using multiple methods is predictive for overall survival (OS) and progression free survival (PFS).

Methods

- Patients with primary GBM who received CRT between 2007-14 and had sequential post-CRT gadolinium-enhanced T1 weighted (T1+C) MRIs post-operatively, at 1 month, and 3 months within our PACS were identified.
- Inclusion criteria for analysis: initiation of concurrent CRT, presence of 1 and 3 month post-CRT T1+C MRIs, absence of clinical or radiographic progression by 3 months post-CRT, and no treatment with bevacuzimab prior to 3 months post-CRT.
- 29/97 eligible patients T+1 C MRIs were subsequently imported into Pinnacle for analysis.
- We quantified bi-directional product (BP), volume of the post-surgical cavity including surrounding enhancement (Vol), and volume of T1+C enhanced rim (Rim) with the cavity subtracted.
- We sought to determine if increases of 5% and/or 25% between PO and 1 or 3 month T1+C MRI's were predictive of worse OS and PFS for each technique.

Results

Figure 1: 3 Month RIM +/-25% OS

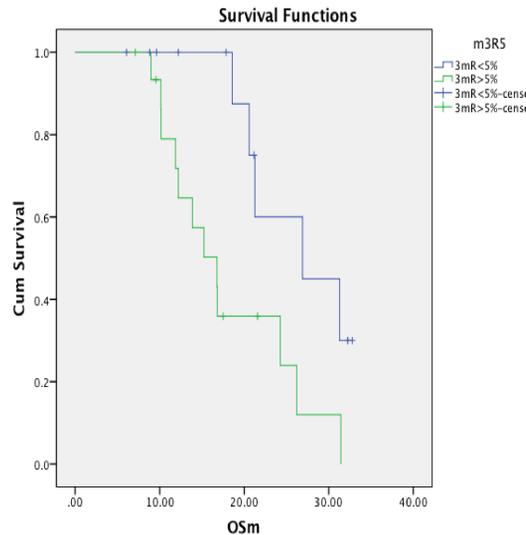


Figure 3: 1 Month RIM +/-5% OS

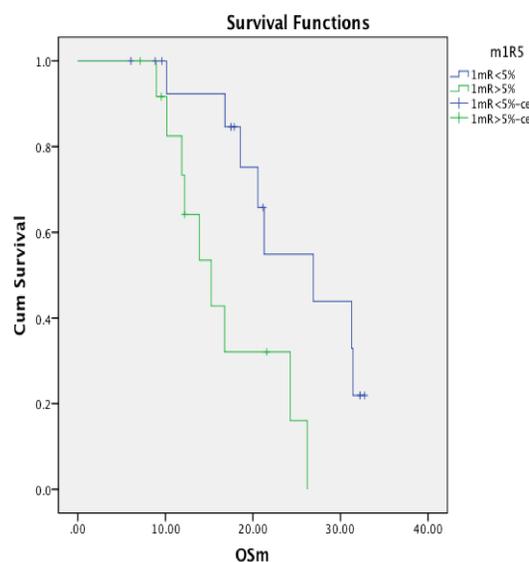


Table 1: Overall Survival (Months)

RIM	<5%	>5%	P1	<25%	>25%	P2
M+1	26.9	15.23	0.010	26.9	13.87	0.001
M+3	26.9	16.77	0.016	31.3	15.23	0.001

Table 2: Progression Free Survival (Months)

RIM	< 5%	>5%	P1	<25%	>25%	P2
M+1	12.0	14.9	0.127	14.93	11.70	0.015
M+3	12.2	9.33	0.203	15.50	10.030	0.011

Figure 2: 3 Month RIM +/-25% PFS

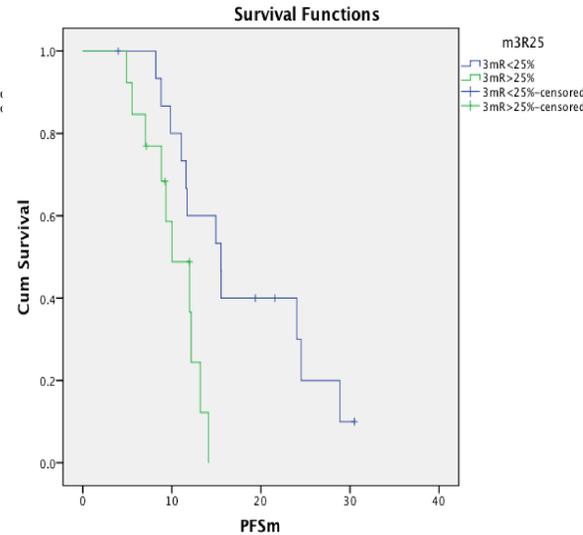
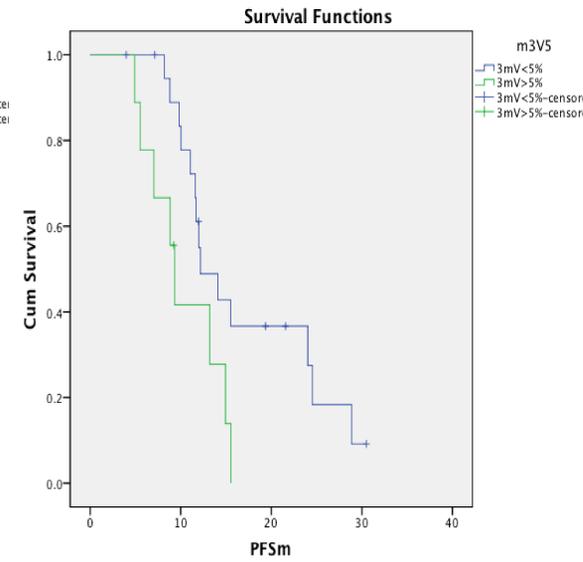
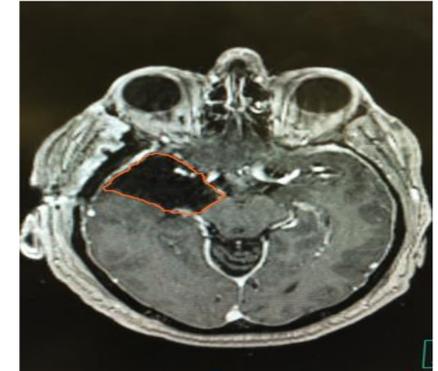


Figure 4: 1 month RIM +/- 5% PFS



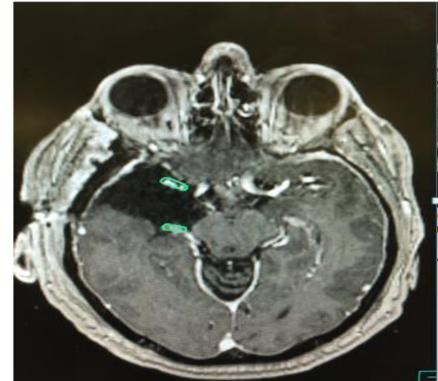
Techniques

Figure 5: Volumetric Technique



Post-operative post-CRT T1 + C MRI. Volumetric technique contours surgical resection cavity. (highlighted in RED).

Figure 6: Rim Technique



Post-operative post-CRT T1+ C MRI. Rim technique contours contrast enhancement (highlighted in GREEN).

Figure 7: BP Technique



Post-operative post-CRT T1+ C MRI. BP technique marks measures volume cavity with the largest x and y axis.

Conclusions

- Even minor change in the relative amount of enhancement surrounding the post-surgical cavity is an early prognostic factor for OS and PFS. Changes of Vol or BP were not significant predictors of OS. These findings suggest that either a lack of early response or underappreciated progression portends a significantly worse prognosis and raises the question of whether salvage therapies should be considered earlier in these patients.