

Use of Volumetric Analysis of Positron Emission Tomography Scans to Predict Pathologic Response in Esophageal Cancer

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Introduction: We assessed the ability of volumetric analysis of hypermetabolic esophageal tissue to predict pathologic complete response (pCR) in patients with esophageal cancer (EC).

Methods: Patients who underwent neoadjuvant chemoradiotherapy and esophagectomy for EC with pre- and post-induction therapy positron emission tomography (PET) scans available were included. Volumetric analysis was performed by manual isolation of the hypermetabolic esophageal tissue. Statistical analysis of the change in volumes, tumor size, and max standardized uptake value (SUV) pre- and post-induction therapy was performed.

Results: 66 patients were included in the study. For the pCR group (n=17), esophageal volume (50.98 vs. 14.97 cm³, p=0.029) and max SUV (19.75 vs. 4.83, p<0.001) were significantly different pre- and post-induction therapy. In the grade 1 response group (n=18), tumor size (4.65 vs. 1.29 cm, p=0.0002) and max SUV (13.06 vs. 4.91, p=0.002) were significantly different. In

the grade 2 response group (n=27), tumor size (4.57 vs. 1.79 cm, $p<0.0001$), volume (54.07 vs. 24.35 cm³, $p=0.0026$), and max SUV (12.88 vs. 5.10, $p=0.0001$) were all significantly different. The grade 3 response group (n=4) had no significant differences. Logistic regression predicting pCR identified change in max SUV as a significant predictor (OR=0.94; 95% CI 0.89-0.99, $p=0.026$).

Conclusion: The results of this study showed significant change in max SUV and esophageal volume pre- and post-induction in the pCR and grade 2 response groups. Our findings indicate volumetric analysis may be used to predict pCR and could be helpful when counseling high risk surgical patients deciding between resection and active surveillance.

References

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Table

	Pre-Induction	Post-Induction	P-Value
Complete Response (n=17)			
Tumor Size (cm)	6.21	2.28	0.08
Esophageal Volume (cm ³)	50.98	14.97	0.029
Max SUV	19.75	4.83	<0.001
Grade 1 Response (n=18)			
Tumor Size (cm)	4.65	1.29	0.0002
Esophageal Volume (cm ³)	22.68	14.64	0.45
Max SUV	13.06	4.91	0.002
Grade 2 Response (n=27)			
Tumor Size (cm)	4.57	1.79	<0.0001
Esophageal Volume (cm ³)	54.07	24.35	0.0026
Max SUV	12.88	5.10	0.0001
Grade 3 Response (n=4)			
Tumor Size (cm)	5.67	4.50	0.43
Esophageal Volume (cm ³)	50.18	18.78	0.103
Max SUV	14.40	7.72	0.27

Table 1: Comparison of pre- and post-induction therapy tumor size, esophageal volume, and max SUV by yp pathologic stage