Metabolic Tumor Volume on FDG-PET Predicts Clinical Outcomes Following Chemoradiotherapy for Locally Advanced Non-small Cell Lung Cancer: A Secondary Analysis of ECOG-ACRIN 6668 / RTOG 0235

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Background

- Approximately 1/3 of the 220,000 patients diagnosed with non-small cell lung cancer (NSCLC) in the U.S. each year have stage III disease.

- $^{18}$F-FDG positron emission tomography (PET) is an important tool for the staging and radiotherapy planning for patients with NSCLC.

- ECOG-ACRIN 6668 / RTOG 0235:
  - A prospective, multi-institutional trial that evaluated the prognostic value of PET for patients treated with definitive chemoradiotherapy for locally advanced NSCLC.
  - PET was performed before radiotherapy and 12-16 weeks after radiotherapy.
  - Enrolled 251 patients.
Background

ECOG-ACRIN 6668 / RTOG 0235: Primary Analysis

Post-treatment Peak SUV

Survival (probability)

SUV > 5.0
SUV ≤ 5.0

$P = .001$

Time Since Post-Treatment PET (months)

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Purpose

• To evaluate associations between pre- and post-treatment PET metrics and clinical outcomes for stage III NSCLC patients treated with definitive, concurrent chemoradiotherapy.
Methodology

• PET Metrics:
  - Maximum SUV (SUVmax)
  - Metabolic Tumor Volume (MTV)
  - Total Glycolytic Activity (TGA)
Results

• Pre-Treatment PET and Local Control:
  ▪ 79/233 patients (34%) demonstrated local failure.
  ▪ Median time to local failure was 25.3 months after study registration.
  ▪ Independent predictors of local control:
    o RT Dose (HR = 0.960 per Gy, p = 0.002)
    o Pre-treatment MTV (HR = 1.036 per 10 cc, p = 0.004)

• Pre-Treatment PET and Survival:
  ▪ 159 deaths out of 214 patients (74%).
  ▪ Median survival was 20.0 months after study registration.
  ▪ Independent predictors of survival:
    o Age (HR = 1.022 per year, p = 0.030)
    o Performance Status (HR = 1.624, p = 0.006)
    o RT Dose (HR = 0.974 per Gy, p = 0.002)
    o Pre-treatment MTV (HR = 1.040 per 10 cc, p < 0.001)
Results

• Post-Treatment PET and Local Control:
  ▪ 68/164 patients (41%) demonstrated local failure.
  ▪ Median time to local failure was 18.6 months after post-treatment PET.
  ▪ Independent predictors of local control:
    o Post-treatment SUVmax (HR = 1.135, p = 0.002)

• Post-Treatment PET and Survival:
  ▪ 119 deaths out of 170 patients (70%).
  ▪ Median survival was 18.2 months after post-treatment PET.
  ▪ Independent predictors of survival:
    o Age (HR = 1.034 per year, p = 0.006)
    o Performance Status (HR = 1.585, p = 0.021)
    o Pre-treatment MTV (HR = 1.029 per 10 cc, p = 0.019)
    o Post-treatment SUVmax (HR = 1.106, p < 0.001)
Results

Pre-Treatment PET and Survival

MTV

> 57.2 cc (above median)
≤ 57.2 cc (below median)
p < 0.0001
Conclusion

• PET metrics are strong predictors of clinical outcomes for stage III NSCLC patients treated with definitive chemoradiotherapy.
  - Pre-treatment MTV
  - Post-treatment SUV<sub>max</sub>