Purpose:

The purpose of this study is to develop new PET-CT features for predicting the pathology response of esophagus tumor to chemo-radiation therapies, and to compare their discriminant power with SUV-max and SUV-peak.

Methods:

Fifteen patients with locally advanced esophagus cancer and treated with tri-modality therapies were studied. All patients underwent a Pre-treatment and a Post-treatment PET/CT. The Pre- and Post- CT images were first aligned with a rigid registration constrained in the chest region. All images were then projected into the Pre-PET coordinate. Two different tumor regions of interest (ROI-SUV2.5 and ROI-SUVPeak) were produced. Various features capturing tumor shape, texture and intensity information were extracted, resulting in a total of 432 features for each patient. Receiver operating characteristic analyses were performed to investigate and compare the discriminant power of each feature. The ground truth was set to be the pathological response in the surgical specimen. Finally, trend analysis was conducted to examine whether a tumor is more likely a responder as the value of a feature increases or decreases.

Results:

Five among all 432 features have higher discriminant power than that of SUV-max and SUV-peak. These include two shape features, one intensity feature, one texture feature and one shape plus intensity feature. Among them, the Decline of Total Glycolytic Volume feature is extracted from the Diff-SUV image. All five features were based on the larger tumor region ROI-SUV2.5.

Conclusions:

Results demonstrated that shape, texture and intensity information are all important for predicting esophagus tumor pathological response to chemo-radiation therapies. Integrating both spatial and temporal information is also important. Features based on a larger tumor region seem to be better than those based on a single point or a smaller tumor region.

Funding Support, Disclosures, and Conflict of Interest: