5P: Application of Novel Machine Learning Model in Predicting Survival in Adrenocortical Cancer

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BACKGROUND

- Machine learning has the potential to revolutionize cancer care, however, its application is lacking in rare diseases such as adrenocortical cancer (ACC).
- ACC has a dismal prognosis and in need of effective therapies and prognostic tools.
- Here we present an AI-assisted technology that can help predict the prognosis of ACC.

METHODS

- 69 patients with at least two 18F-FDG PET scans were analyzed.
- Regions of interest (ROIs) were quantified and matched across baseline and follow-up scans using TRAQinform IQ (AIQ Solutions).
- Features within and across imaging timepoints were used to predict prognosis.
- Univariate predictive power of overall survival prediction of each feature was determined using Cox regression models.
- TRAQinform Profile (AIQ Solutions) was calculated to predict overall survival using 3-fold cross-validation of a random survival forest.

RESULTS

- The overall disease burden at the baseline (Global Total 1) was the strongest univariate predictor of overall survival (c-index = 0.68).
- This was followed by disease burden at follow-up (Global Total 2, c-index = 0.65), number of ROIs in the lungs at follow-up (Lungs 2, 0.62), and number of increasing regions of interest (PD, 0.62).
- TRAQinform Profile was able to predict the responder’s vs non-responder outcomes to the standard of care treatment (c-index = 0.70) (Fig.3).

CONCLUSION

- This quantitative analysis can be translated to tailoring the treatment options to a more personalized approach.
- Machine learning algorithms are rapidly evolving and new tools using AI are being added to the repertoire of cancer management.
- Here we present an AI-assisted technology that can help predict the prognosis of ACC patients’ disease based on the analysis of the 18F-FDG-PET/CT images.

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CONFLICT OF INTEREST: DL, RMG, and TP are employed by AIQ Solutions (Madison, WI, USA). Ojaswita Lokre was employed by AIQ Solutions (Madison, WI, USA).

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Fig.1 Image processing workflow of TRAQinform IQ: across multiple timepoints, PET/CT images are taken, ROIs are identified and classified, ROIs are localized and quantified; then change in each ROI is quantified across timepoints.

Fig.2. Best univariate predictors of survival: (a) c-indices for top 5 features based on Cox proportional-hazard model. (b, c) Kaplan-Meier curves for two best univariate predictors, global SUVmax at baseline (b) and at follow-up (c).

Fig.3 TRAQinform IQ analysis of representative TRAQinform Profile predicted (a) responder and (b) non-responder; and (c) full Kaplan-Meier curves for all 69 patients analyzed (p<0.001, c-index = 0.76).