Article Summary

*Prostate Surface Distension and Tumor Texture Descriptors From Pre-Treatment MRI Are Associated With Biochemical Recurrence Following Radical Prostatectomy: Preliminary Findings*

Approximately 1/3 of prostate cancer patients will experience biochemical recurrence after the radical prostatectomy (RP) procedure. To predict the risk of this occurring, multiparametric magnetic resonance imaging is employed and radiomic texture features are used in risk characterization of prostate cancer and can predict biochemical recurrence. However, these features, shown from the mpMRI, can differ based on variations in the scanner and other features. In response to this, the study presented in the paper details a new method of using radiomic shape descriptors to quantify shape distention.

133 prostate cancer patients comprised the study and the new 3D shape atlas-based approach was used to determine prostate shape distention descriptors, which were used to train a random forest classifier Cs to predict biochemical recurrence (BCR). Another method, texture radiomics was employed with a machine learning classifier (Cr) used to predict BCR. An integrated classifier Cs+Cr used both Cs and Cr to make predictions. These three models were used and evaluated on a independent validation set. The integrated classifier was compared to before RP and after RP variables as well as nomograms for BCR-free survival at 3 years. To compare the three classifiers, statistical analysis was employed.

There were three principal results from this study. The first of this was that the integrated BCR prediction model Cs+r had a significantly higher area under the curve than just Cs or Cr in predicting BCR. On univariable analysis for predicting biochemical recurrence free survival (bFS) at three years, Cs+r had a higher hazard ratio when compared with pre-RP clinical variables for the same bFS. However, on multivariable analysis, post-RP Gleason score, extraprostatic extension, and positive surgical margins had higher hazard ratios. Lastly, Cs+r achieved the highest C-index (0.76+-0.06) for pre-RP clinical variables when compared with pre-treatment CAPRA and post-RP Decipher Risk, but post-RP CAPRA-S resulted in a comparable hazard ratio.

In conclusion, when comparing pre-treatment clinical variables, Cs+r predictions had the highest hazard ration and C-Index when predicting bFS. Cs+r was also better than CAPRA at predicting bFS when comparing pre-treatment clinical variables. However, the post-RP Gleason score resulted in a comparable performance to Cs+r.

This study found that radiomic texture features of a prostate cancer lesion used in conjunction with radiomic shape distention features was a better predictor of BCR. This new approach could potentially be employed at clinics in pre-treatment MRI scans to assess the risk of BCR in a patient.