Development of a Novel Biomarker Algorithm for the Early Detection of Liver Cancer

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The objective of this project was to develop and test a novel biomarker algorithm for a screening test for the early detection of liver cancer. Liver cancer has risen to the forefront of lethal diseases with a poor prognosis and lack of late stage treatment methods. Because of this, a stronger early detection method is necessary to replace the current single marker testing. It is widely known that the current most used screening marker, alpha fetoprotein (AFP), is weak in sensitivity (~50%), but has high specificity (~90%). Due to the heterogeneity of liver cancer, there are multiple biomarkers that can be used together in a model to improve the sensitivity of early detection. This project's approach involved testing two separate methods for early detection: a tree system and an combination approach. I hypothesized that the tree model would perform better as a screening test due to the high specificity of AFP. After analysis of the individual biomarkers, generation of receiver operating characteristic (ROC) curves, and final comparison of sensitivity values, the tree model was demonstrated to be the stronger of the two models, with a sensitivity of 96% and a specificity of 88%. The tree model also has significantly higher sensitivity than AFP and has comparable specificity, which was further validated in a blind prediction analysis on a separate blind population set. This discovery could potentially have a significant impact on the field of liver cancer diagnosis, as this approach may be applied to other cancers as well.

Awards Won: