Tumor antigens as proteogenomic biomarkers in invasive ductal carcinomas

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Abstract

Background: The majority of genetic biomarkers for human cancers are defined by statistical screening of high-throughput genomics data. While a large number of genetic biomarkers have been proposed for diagnostic and prognostic applications, only a small number have been applied in the clinic. Similarly, the use of proteomics methods for the discovery of cancer biomarkers is increasing. The emerging field of proteogenomics seeks to enrich the value of genomics and proteomics approaches by studying the intersection of genomics and proteomics data. This task is challenging due to the complex nature of transcriptional and translation regulatory mechanisms and the disparities between genomic and proteomic data from the same samples. In this study, we have examined tumor antigens as potential biomarkers for breast cancer using genomics and proteomics data from previously reported laser capture microdissected ER+ tumor samples. Results: We applied proteogenomic analyses to study the genetic aberrations of 32 tumor antigens determined in the proteomic data. We found that tumor antigens that are aberrantly expressed at the genetic level and expressed at the protein level, are likely involved in perturbing pathways directly linked to the hallmarks of cancer. The results found by proteogenomic analysis of the 32 tumor antigens studied here, capture largely the same pathway irregularities as those elucidated from large-scale screening of genomics analyses, where several thousands of genes are often found to be perturbed. Conclusion: Tumor antigens are a group of proteins recognized by the cells of the immune system. Specifically, they are recognized in tumor cells where they are present in larger than usual amounts, or are physiochemically altered to a degree at which they no longer resemble native human proteins. This proteogenomic analysis of 32 tumor antigens suggests that tumor antigens have the potential to be highly specific biomarkers for different cancers.

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