Susceptibility to hyperthermia treatment through CTCs study

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Introduction: The cancer treatment management is of primary importance in scientific committee. Increasing disease-free and overall survival can be achieved with appropriate treatment strategy. On the contrary, inappropriate treatment plan might lead to inefficient results including adverse side effects. Liquid biopsy is widely used for designing the correct treatment algorithm for almost all types of therapy including hyperthermia. The present study aimed to identify any potential correlation among CTCs number and resistance to hyperthermia through gene expression profile of Heat Shock Proteins (HSP).

Methods: The study included 181 cancer patients with different cancer types (57 breast, 10 colon, 21 lung, 21 prostate, 6 pancreatic, 5 ovarian, 5 sarcoma, 56 other types like myeloma, lymphoma etc.). CTCs were detected, isolated and enumerated with flow cytometry methods and gene expression analysis followed for heat shock proteins by using qRT-PCR. Normal samples as well as reference samples were used in all reactions.

Results: The CTCs' population differed among the different cancer types. The samples were characterized as resistant or sensitive to hyperthermia, according to their HSP gene expression. The majority of samples were sensitive; however a small amount (8.2%) was resistant to this type of therapy. These included mainly breast (46.6%) and colon (20%) cancer samples, while resistance was also observed in single cases for pancreatic, ovarian, NSCLC, head/neck and esophageal cancer. All prostate cancer samples were sensitive to hyperthermia. In breast cancer, resistance was observed independent of stage, but probably dependent with CTCs number (7.41±0.53/7.5ml with average CTCs 6.34±0.2/7.5ml). In colon patients with CTCs 7.97±0.71/ml, the resistant samples had 10.13±1.12/ml.

Conclusion: The enumeration of CTCs as well as the study both at gene and protein level enables the prediction of response in different types of therapy, thus avoiding undesirable side effects. Their gene expression profile could be also used for measuring susceptibility to hyperthermia. More samples need to be tested so to be used at clinical level.