Information gain in considering individual tumor size lesion dynamics for future model developments: classification and clustering are the 1st step forward

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Objectives: Developing a methodology to evaluate the gain in classifying individual tumor lesions (iTLS) into different tissues, to be used further in modelling of resistance to anticancer drugs, rather than the sum of tumor sizes.

Methods: A novel methodological approach for the non-parametric analysis of iTLS has been defined by integrating knowledge from signal processing and machine learning. Specifically, the proposed workflow uses (i) a rule-based algorithm to classify iTLS based on functional and location criteria, (ii) the cross-correlation to estimate the similarity among classified TL dynamics by also considering potential delays, (iii) K-means clustering on cross-correlation measures to obtain a straightforward result interpretation. Thanks to the defined classification, the assessment of similarity of TL dynamics can be then performed both at the inter-class level (i.e., among TLs differently classified) and intra-class level (i.e., among iTLS similarly classified) (Figure 1).

Results: We have classified 2038 individual target lesions of 642 mCRC patients from two Phase II studies. Different dynamics of classified TLs were highlighted in 30% of patients involved in the inter-class analysis. In particular, 35% of cross-correlation measures computed without considering any delay indicated poor similarity. The degree of similarity substantially increased when considering delays between lesion dynamics. Similarity of iTLS dynamics was mainly indicated by results of the intra-class analysis.

Conclusions: The proposed approach, flexible enough to be applied to many cases and at different levels, provides a deeper understanding of available data and guides next modelling steps [1] by coupling the information on target TLs along with the lesion dynamics.

Results in this abstract have been previously presented in part at PAGE 24, Hersonissos, Crete, 2-5 June 2015 and published in the conference proceedings as abstract 3399.

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